PMI

VOL.4NO.6
JUNE
1961
PRICE 50c

PHOTO METHODS FOR INDUSTRY

A-V SECTION

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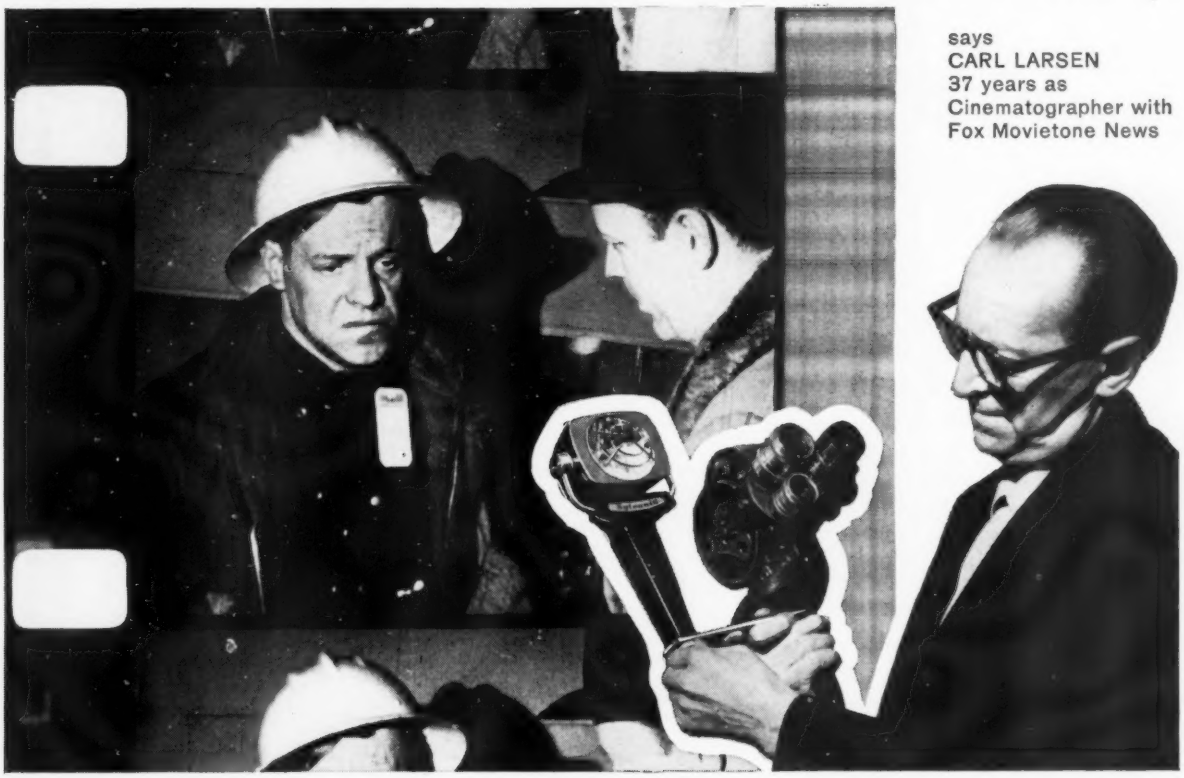

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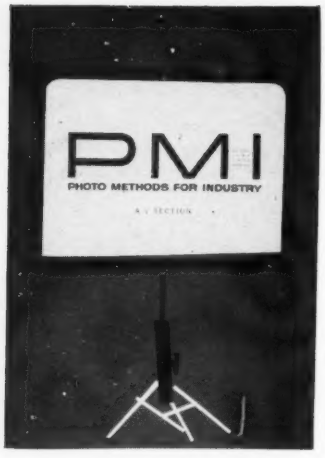

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PMI—Photo Methods for Industry is published monthly by the Gellert-Wolfman Publishing Corp., 33 West 60th St., New York 23, N. Y. Plaza 7-3700. Mid-west: 6316 N. Lincoln Ave., Chicago, Ill. Irvington 8-4242. Coast 13016 Victory Blvd., N. Hollywood, Calif. Triangle 7-7917. Copyright 1960 NPD Corp. Single copies 50 cents. Yearly subscription price, including the PMI Directory published in Oct. in addition to the regular issue, is $5.00 in U.S.A. and Canada. Elsewhere $10.00. Editorial contributions must be accompanied by return postage and will be handled with reasonable care; however, the publisher assumes no responsibility for return of unsolicited photographs or manuscripts. SUBSCRIBERS: Send subscription inquiries and address changes to Circulation Manager, Photo Methods for Industry, 33 West 60th St., New York 23, N. Y. Give old and new address, including zone number, if any. Enclose address label from last issue and allow five weeks for change to become effective. POSTMASTER: Send form 3579 to Photo Methods for Industry, 33 West 60th St., New York 23, N. Y.

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DJATI SANTOSO TOOK IT BACK TO INDONESIA

Djati (we called him Johnny) Santoso learned a lot about fine film processing during the 18 months he studied with us here at CFI. He is a bright, capable young fellow . . . soaked up a good deal of our 40 years of know-how fast.

Johnny was one of some 30 foreign students who have come from all over the world to learn film processing from the master craftsmen here at CFI. He got around, studied in every department, and is now returning to the new Central Film Lab in Djakarta to take charge of their "quality control" function. And he intends to pass on the skills he learned by teaching his own people.

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F.Y.I.

The Ninth Annual Western States Convention of the Professional Photographers Association of California will be held July 6-10 at Long Beach, Calif. The program will cover commercial, industrial and portrait fields, with lectures by specialists and displays of new equipment. Included in the industrial program will be discussions on photography in deep space investigation, crystallography, the smear camera, audio-visual, etc. The social program has been equally developed so that "a good time will be had by all" according to the information we got. It seems like a good way to combine work and play so if you are in the neighborhood, just drop in. For details, write Natalie Rokusek, Executive Manager, Professional Photographers of California, 609 Sutter Street, San Francisco.

For the first time, industrial photographers have been elected to top regional posts in the Professional Photographers of America. At a combined convention of the Southeastern Professional Photographers and the Tennessee Professional Photographers in Chattanooga in April, the following in-plant people made good:

James Garrett, Head, Photographic Reproduction Laboratory, Engineering Experiment Station, Georgia Institute of Technology, named President of the Southeastern group; J. Phil Tarver, Photo Supervisor, Aro, Inc., Arnold Air Force Station, and Robert Costello, Photographer 1/C, USN, Naval Air Reserve Training Unit, Memphis, veeps of the Tennessee Professional Photographers Association and of the Tennessee PP of A, respectively.

Top award in the print exhibit went to Harley Ferguson, Photographic Department, Georgia Institute of Technology.

Everyone knows that television commercials are lousy and that if they had the chance, they would show the wheels how a commercial should be done. Paillard is giving you this chance, doing a one-minute filmed commercial on Bolex 8mm or 16mm equipment. The film may be 8mm or 16mm, black-and-white or color, silent or sound. Contest closes August 1. For details, see the latest issue of *Bolex Reporter.*

A new rental program covering high-speed equipment is announced by Beckman & Whitley, San Carlos, Calif. Designed for small research and development projects, the program permits rentals as short as one day on Dynafax, Magnifax and Model 189 cameras. The charge is based on the cost of the equipment. Included in the program is five days of instruction and an additional five days of consultation by a photo instrumentation engineer.

K & L Color Service, owned by a pair of estimable gentleman yclept Lang and Zoref, is taking over the entire five-story building at 10 East 46th St., New York. The firm was founded in 1949, requiring but 600 sq. ft. at the time. All we can think of at this point is the man who talked about better mousetraps.

Theft is a nasty business any way you look at it, one which is especially hard on people who, like photopraphers, use valuable objects in small packages. Many photographers have discovered missing equipment and after cursing madly, put in a claim to their insurance company. Sometimes, though, the stolen object can never be replaced. Such an object is a Leica A belonging to Bob Schwalberg, one of the best technical experts around and an ardent, though not uncritical, Leicaman.

This model A, serial number 128, is the 29th Leica ever sold. It is part of Bob's Leica collection and was taken from his office at E. Leitz, New York. A reward of $200 and no questions asked is offered.

Also stolen was a Leica M2 body (with crank, Camian, rewind), No. 982861; 21mm f/4 Super Angulon, No. 1,646,854; 35mm f/2 Summicron, No. 1,632,099; 50mm Dual-Range Summicron, No. 1,375,813 and 90mm f/2.8 Elmarit, No. 1,692,540.

Another expansion is announced by Jack Asher. Lab-TV is taking over more space at their present address, 723 Seventh Avenue, New York City. If this be progress, let's have more of it.

WHAT IS A FINE CAMERA?

what distinguishes it–what sets it apart from all the others?

Essentially, a camera is a thing of metal and glass and sundry materials. There may be reason to admire it for its physical beauty and its workmanship. But, as an instrument of creativity, it is not unlike the silent strings of a violin and demands the expressive skill of human hands to give it the breath of life.

The true great quality of a fine camera is its responsiveness. It is this quality of yielding obedience to the will of the user that makes a fine camera an articulate medium–instead of a mere mechanical device. It is the quality which recognizes the creative purpose of the user, and endows him with the freedom essential to its fulfillment.

It is because of this quality of responsiveness that the Nikon F has won the coveted acclaim of the most earnest and critical devotees of the 35mm art. And it is because of this quality–among others–that the Nikon F is now used so widely by professional working photographers and serious amateurs. It is a camera that offers the promise of creative mastery to all men to whom photography has become a form of self-expression.

If photography has come to mean that much to you, you owe it to yourself to see and try the Nikon F. Price is $375 with Auto-Nikkor f1.4; $329.50, with Auto-Nikkor f2. For complete details, write to Dept. PM-6.

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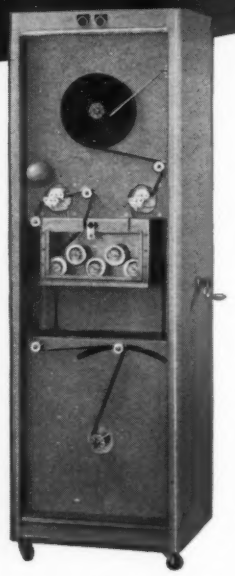

Model A-5100 combination 16/35 mm film cleaner. Other cleaners available for 16 mm film only, 35 mm film only and for 70 mm film only. Price: Model A-5100 $5,500 f.o.b. Sylmar, California.

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EXPORT DIVISION
301 Clay Street, San Francisco, California

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COMING UP

JUNE 26-30 Quality Control for the Graphic Industries, introductory program. Rochester Institute of Technology, Rochester, N. Y.

JULY 6-10 Professional Photographers of Calif., Inc., Western States Convention. Long Beach, Calif.

JULY 16-20 National Institute for A-V Selling, courses for A-V businessmen. Indiana U., Bloomington, Ind.

JULY 22-25 National Audio-Visual Convention. Morrison Hotel, Chicago.

JULY 30-AUGUST 4 Professional Photographers of America, Inc., 70th Annual Exposition of Professional Photography & 9th National Industrial Photographic Conference. Statler Hilton Hotel, New York, N. Y.

AUGUST 19-23 Techniques of High-Speed Photography Seminar, directed by Professor Harold E. Edgerton. MIT, Cambridge, Mass.

AUGUST 21-24 Biological Photographic Association Annual Meeting. Pick-Congress Hotel, Chicago.

MONTHLY MEETINGS

Association of Federal Photographers Meetings every third Wednesday at 8 p.m. G.S.A. Building, 7th and D Sts., S.W., Washington, D. C.

Binghamton Chapter SPSE Meetings every third Tuesday. Contact H. G. Morse, Ansco, Binghamton, N. Y. RA 2-4221, Ext. 573.

Boston Chapter SPSE Contact John Taylor, Itek Corp., 10 Maguire Rd., Lexington, Mass., VO 2-6200.

Chicago Chapter Biological Photographic Asso. Meetings every third Tuesday. Contact Dorothy Pinkham, 551 W. Grant Pl., Chicago. DI 8-6400.

Cleveland Chapter SPSE Meetings the first Tuesday of each month. Cleveland Engineering & Scientific Center, 3100 Chester Ave., Cleveland, Ohio. Contact Robert E. Birr, General Electric, Nela Park, Cleveland. GL 1-6600.

Industrial Photographers of America Essex House, Newark, N. J. Meetings every second and fourth Thursday. Contact Tom Holbarton, 181 Lake Drive West, Packanack Lake, Wayne, N. J. or R. Handley, The Port of New York Authority, 111 8th Ave., N.Y.C.

Manhattan Chapter Society of Reproduction Engineers Meetings every third Monday. Contact J. Ryerson, Joseph Dixon Crucible Co., Newark 2, N. J. DE 3-3000.

Midwest Industrial Photographers Association Contact John E. Schrage, c/o Deere & Co., Photo Department, 3300 River Drive, Moline, Ill.

National Visual Presentation Association, Inc. New York City. Meetings every second Thursday. Contact M. E. Shack, 19 W. 4th Street, New York, N. Y. MU 2-2294.

New York Chapter SPIE Meetings every third Thursday. Contact Don Bass, P.O. Box 177, Bethpage, L. I., N. Y. Liggett 4-8196.

New York City Chapter SMPTE Meetings first or second Wednesday of each month. Contact Ed Warnecke, Eastman Kodak Co., 342 Madison Ave., New York, N. Y. MU 7-7080.

New York City Chapter SPSE Monthly programs. Contact Richard H. Haard, Bell Telephone Labs., N.J., CH 3-1000, Murray Hill Ext. 2182.

Rochester Chapter SPSE Second Thursday. Contact Woodlief Thomas, Jr. Color Technology Division, Building 65, Kodak Park, Rochester 4, N. Y. CO 6-2500.

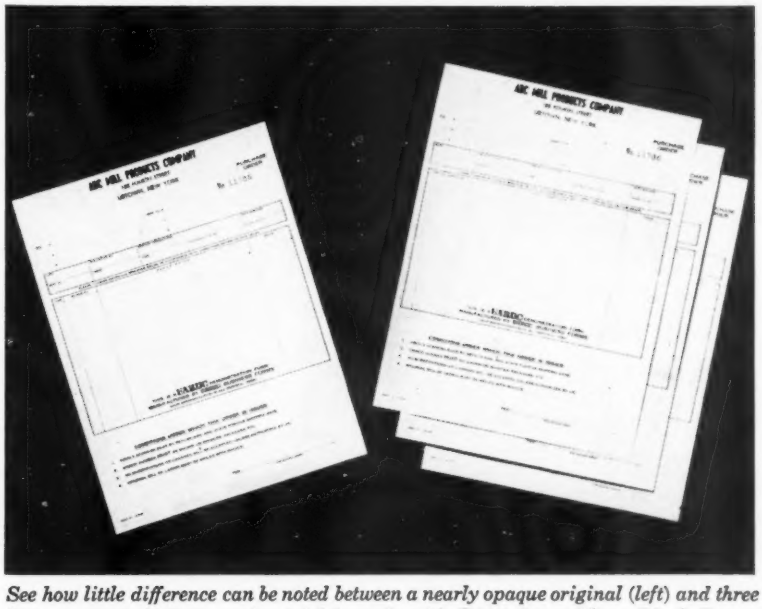
Rocky Mountain Industrial Photographers Meetings every fourth Monday. Contact P. H. Broadie, 2170 S. Lincoln, Denver 10, Colo. PEarl 3-2200.

Southern California Chapter, Biological Photographic Assn. Meetings every third Thursday. Contact Avis Gregersen Warner, Box 78, 1200 N. State St., Los Angeles 33, Calif. CA 5-3131 ext. 7-1319.

Southern California Chapter SPSE Meetings the last Monday of each month. Contact Ben Augustine, 235 Annandale Rd., Pasadena 2, Calif. Telephone MU 1-0076.

Southern California Chapter Industrial Photographers Meeting every third Tuesday. Contact Janet Marshall, Executive Secretary, 5463 Virginia Ave., Los Angeles 29, Calif. HO 5-6614.

REPRODUCTION TRENDS



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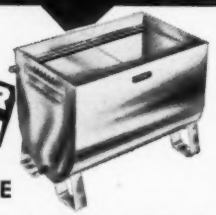

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David B. Eisendrath, Jr.

WORKING PHOTOGRAPHER

Some comments on techniques: ideas exchanged at PP of A

Undoubtedly one of the best exchange of ideas and information in the field of industrial photography is the National Industrial Photographic Conference, which is held each year as part of the Professional Photographers of America Annual Convention. Almost all of the interesting programs, bull sessions and round tables are well reported and documented in various publications (including this one). The 1961 meetings will be in New York City, July 31-Aug 4th—as you are probably already aware.

The Tools and Techniques Forum of the Industrial Conference, moderated each year by Jim Hampson of Shreveport, La., is *always* well attended, has excellent participation, and probably drops more small nuggets of wisdom than any other program of the entire conference.

This is the program where members of the audience tell of, and show off, some ingenious technique, gadget, system or trick that has saved time and money for their company.

Inasmuch as I am a confessed (and professed) gadget man myself, I make copious notes on the ideas presented each year, since no other record of this event is made public.

Some of the highlights of last year's meetings are given here to encourage you to point out to your management some of the many things to be learned if they'll let you attend this year's meeting.

Hail fellow, well-met

Genial Jim Hampson called this session together with a "Hailer"—one of those transistorized, battery-operated megaphones that throws your voice loud and clear. Jim showed the Audio Equipment Co.'s "Hailer Cub" that weighs under 3 lbs. and explained that he used this on industrial jobs when working from a tower or light plane to communicate with people on the ground below, tell them to clean up debris, move a car or some other object cluttering up the picture. He also uses this from the ground to direct a man up on a tower. (Incidentally, if you ever have occasion to use a device like this, you ought to know that some kinds of them can be used in reverse: you hold the speaking end to your ear and you can pick up conversation at a distance. The N.Y. Fire Department uses theirs this way to communicate with men on tops of buildings.)

Spinning contrast

Then Richard Reese of Bjorksten Research Laboratories showed his trick of mounting a small spotlight filter-wheel under his Omega enlarger, having adapted it to take the variable contrast filters most commonly used. In this way he can focus and spin any filter or combination of filters into place easily and without jiggling the enlarger. He also showed an idea borrowed from the science lab: when he wants a constant flow of water at controlled temperature and has no automatic regulator available, he runs both hot and cold water into a large glass jar (1 or 2 gal.). He arranges a lab cork, glass tubes and a thermometer to handle the input and the outflow. In his arrangements any fluctuation in water temperature in the line is modified by being mixed with a larger quantity; adjustments can be made before they materially affect the outflow. Another cute trick that Dick showed was one he used when called upon to make motion pictures of microscope subjects where there was no motion in the subject. To pep up his movies and give the appearance of action, he makes still pictures with his Rollei, enlarges them and then records them on movie film with a zoom lens—zooming in to the critical area to be examined and then moving around in the field. Bright boy!

(*continued on page 12*)

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When short and normal lenses are being used at normal distances, rangefinder viewing and focusing is easier and very much more accurate. Through-the-lens viewing and focusing offers advantages when long lenses are being used or in extreme close-up photography.

When you own a Leica, you may choose from rangefinder-coupled lenses 21mm to 135mm in length. *With the same Leica* and a VISOFLEX II, you may use lenses from 65mm to 400mm in length. A number of the lenses can be used with both systems. Designed for fast hand-held shooting and eye-level comfort, the VISOFLEX II delivers an upright, unreversed image on a ground-glass screen so fine-grained and clear you forget it's there. You also forget the VISOFLEX II is there, it's so compact and so much a part of the Leica. The smooth precision operation is typical of any Leica-accessory combination.

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"We Make Sure Our Training Sessions Run Smoothly by Using Kalart/Victor Projectors..."

"The way we use 16mm sound films," continues Mr. Al Tinker, President of Tinker Kirby Nassau Company, Inc., "we need a projector that is dependable at all times. Films play a big role in our program of training men how to sell Kirby Home Sanitation Systems. When we schedule a training session, we want to know that the projector will do its job at the flip of a switch. Our Kalart/Victor fills the bill on this count, and many more besides."

A company such as Tinker Kirby Nassau, with so much at stake in its training program, particularly appreciates the fact that Kalart/Victor projectors are engineered to provide trouble-free performance in continual daily use.

Simplicity of threading, ease of maintenance and protection against film damage are other important features that Mr. Tinker looked for—and found—only in Kalart/Victor.

Three-step threading with color-coded path showing sequence and location makes it easy for nearly anyone on Mr. Tinker's staff to set up a Kalart/Victor. Safety Film Trips, a Kalart/Victor exclusive, prevent damage to valuable training film. And a large-capacity oil reservoir built into the Kalart/Victor means that lubrication is necessary only once a year.

What features are you looking for in a 16mm sound projector? Great picture quality? Magnificent sound reproduction? Adaptability for magnetic recording and playback? Kalart/Victor has them all. Call your Victor Dealer for a demonstration.

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WORKING PHOTOGRAPHER

(*continued from page 10*)

Jim Hampson then showed a trick of his where he explained he had trouble getting a grey card into a landscape shot on a color negative because the standard grey card is so small that in a big scene it gives too small an image to get good readings from. So Jim has some grey cards printed very large (about the size of four standard cards) that fold small for carrying but can be put into the to-be-cropped border of the scene.

Quickie movie

One of the best techniques that I'd seen in a long time, and one that may well be worth knowing about is one shown by James Genders of the Public Service Co. of Indiana. He says that sometimes he has had to produce a quick sound movie which may be needed in a hurry (like last week) or for customer approval, or perhaps for only two or three time use. He threads his assembled film into a Bell & Howell 202 Magnetic Sound Projector. At the same time, he mounts a reel of blank sound-striped film (perforated for projection on the take-up reel, from which he removes the drive belt, and threads it through the recording and pick-up head. Once threaded into the machine, he makes a small edge notch in both the picture film and the sound-striped film so they can be matched later. Both films are driven into a cloth-lined basket. While the picture is shown narration is recorded onto the sound stripe. By carefully rethreading both films in sync after rewinding, the film and separate track can be projected for final approval, or for a few special occasions. Afterwards the sound track can be put onto a sound-striped print, or erased.

Big wheels

Richard Morris of International Harvester then showed a ready-made photo-cart that they purchased as a linen cart from a motel supply company for taking equipment around the plant. He pointed out that the motel carts are made or use out of doors and have bigger wheels and are stronger than the usual hotel cart.

You can see that a two-hour session of an exchange of ideas like these can be very stimulating.

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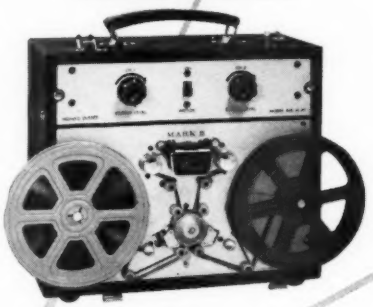
SOUNDS of Advancement from PICTRONICS

The New Magnasync Mark II

DUBBER



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The "little giant"! That's what you'll call this new precision dubber when you check all the professional features Magnasync has built into such a small unit—

- SMPTE standard performance
- Completely transistorized
- Exceptionally light in weight
- Extremely easy to operate
- Low power consumption
- Smartly housed in durable carrying case (standard rack mount also available)
- Flutter & Wow—.25% or less
- Distortion—2% or less
- Frequency Response—50 to 8000 ± 2 db
- Signal to Noise—50 db or better
- Film Capacity—400 ft. split 16mm

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NOW, LIP SYNC SOUND WITH ANY BOLEX CAMERA

A new development by Magnasync is being hailed as a boon to industrial and in-plant movie makers, freelance TV cameramen and others who find themselves with a low budget with which to produce a sound film. Called the Magnasync Nomad Mark I, it is a completely transistorized, truly portable magnetic sound recorder—(weighs only 7 lbs.). Split 16mm magnetic film, rather than tape, is used and provision is made for recording separate sound tracks for voice and for music. The two tracks are automatically mixed when played back thus eliminating the need for sound dubbing as well as for making a duplicate of the original film to get a composite print to combine picture and multiple sound tracks.

The new Magnasync Nomad Mark I not only makes the Bolex a sound camera, it will make any 16mm camera a sound camera and any projector a sound projector. In filming or projecting, positive interlock is achieved by a flexible cable. This cable is lead from the camera and plugged into the proper jack of the recorder. The spring motor that turns the camera thus drives the recorder. For projecting, a flexible cable, with its own gear box, is attached to the framing knob of the projector and to the Nomad.

The light - weight Magnasync Nomad Mark I is mounted directly under the Bolex with a special bracket. Provided with the unit is a set of earphones for monitoring and a remote hand mixer that contains VU meter, record and playback controls, film-direct monitor switch, battery test switch, microphone input and earphone output jacks.

To assist Bolex owners to fit their cameras with the new Magnasync Nomad Mark I, and to instruct them in its use, a special department has been set up by Pictronics, Inc., 236A E. 46th Street, New York City.

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- Projector interlocks available
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- Wow & Flutter—.25% or less
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- Frequency Response—50 to 8000 ± 2 db

- Signal to Noise—50 db or better
- Film Capacity—400 ft. split 16mm

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Edward R. Farber

ELECTRONIC FLASH

Souping up the Braun Hobby F60; photoflash notes, news, answers

As they say, it's not the heat, but the humidity, so remember that it's time again to clean and insulate with silicone grease the trigger and photocell connection surfaces of your electronic flash and slave units. (See June 1960 column.)

The Braun Hobby F60 (A nickel-cadmium battery model) and the F30 (a size C dry battery model) are compact, lightweight flash units with an extremely small (about 1 x 3 x 2 in.) flash head having 65 degree horizontal and 60 degree vertical coverage. A number of New York press and magazine photographers enamored of the small size and efficiency of the lamp head, but wanting very rapid recycling, have connected a 525V battery and capacitor pack to the standard Braun Hobby lamp head to get about a 2 to 3 sec. flash interval. We are told that some have put 100 watt-sec. through the lamp without greatly reducing lamp life —but don't expect the manufacturer to guarantee the tubes under such circumstances.

Hershey tech reports

Hershey Manufacturing Co., 853 Dundee Ave., Elgin, Ill., has prepared two "special technical reports" which are well worth writing for. One—*Recycling Time Versus Consistent Exposure—A Compromise* discusses how "ready" an electronic flash unit is when the ready light glows. It presents some interesting charts and graphs and explains the problems faced by a designer. Report II is titled *A Simple Light Meter and Modeling Light Method for Determining Proper Exposure with Electronic Flash*, and discusses how to use your standard exposure meter and modeling lights to get proper exposure.

When do-it-yourselfers get involved in the high voltages, they find parts difficult to locate and very expensive. For them we recommend the catalog of the Barry Electronics Corp., 512 Broadway, New York 12, N. Y., known as Barry's Green Sheet (which arrived this St. Patricks day with an orange cover). This firm specializes in surplus parts and has a great variety of capacitors, transformers, power supplies, relays, most of which are listed at very reasonable prices.

Many surplus capacitors are rated for use as AC motor starting capacitors. These can be used successfully on DC at three to four times their AC rating. For example, GE Pyranol 440 AC Motor Starting Capacitors have been used successfully for years at 2000 volts in electronic flash units. However, the internal leads are not made for heavy discharge service and may fail in the event of rapid flashing or heavy short circuit currents. These capacitors can be purchased for under five dollars however, so are still bargains for the experimenter.

Last July we discussed briefly the installation of flash units in missiles. A detailed discussion of the design of one such unit is found on page 88 of the November 11, 1960, issue of *Electronics:* "Tracking Missiles at Night by Light Flashes."

Farber tells all

QUESTION: We have the equipment and facilities here in the plant to build units. If you can supply us with a schematic which would yield 36,000 BCPS it would be greatly appreciated?

ANSWER: I am enclosing herewith a General Electric Flashtube manual which should give the necessary information to enable you to construct a 36,000 BCPS unit. Please see also the book *Flash*, (revised edition) by Edgerton and Killian for much additional technical information found in the appendix.

You might also write to the

(*continued on page* 16)

What could possibly make a camera worth $550?

THE work you can do with it, nothing else.

The precision and resolving power, for example, that have led many studio photographers to use a Hasselblad 2¼ x 2¼ single-lens reflex instead of an 8 x 10 view camera.

The interchangeability of lenses, film backs and accessories—over 100 camera set-ups in all—that enables a professional to carry a Hasselblad instead of half his studio on location assignments.

The automatic aids that let the pro concentrate on his subject instead of the camera, and help the amateur make up in part for the intimate knowledge of light and optics that marks professional work.

Hasselblad lenses, for instance, make color and detail almost automatically perfect. These lenses have Synchro-Compur shutters and are made by Carl Zeiss of the best optical glass in the world. Resolving power—the acid test of any lens—permits greater enlargements than virtually any other lens made today.

The Hasselblad reflex system alone costs more to make than many cameras sell for. On its ground glass viewer you see a print-size preview of the quality you will get—focus, depth of field right through the lens (and no parallax). A pop-up magnifier even shows details too tiny for the naked eye.

Diaphragms of Hasselblad lenses are automatic. They remain open until you shoot, so that your view cannot get away from you. If you wish, you can also stop the diaphragm down by hand.

The EVS system synchronizes diaphragm openings to shutter speeds. You simply set your lens for a code number and your speed and aperture will be automatically aligned. You can then change to any other speed and your aperture will change with it—automatically.

Hasselblad interchangeability? You can switch from color to black and white in mid-roll, or from telephoto to wide angle, or to a sports viewer, or to a magnifying hood for shots through a microscope. You can set up for almost every shot known to photography in seconds.

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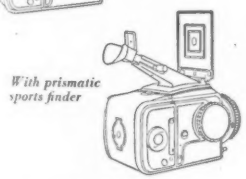
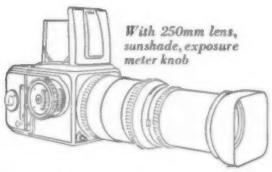


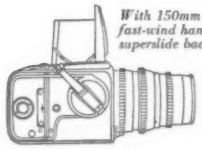
With prismatic sports finder

With 150mm lens, sunshade, flash gun bracket, back for 12 2¼" x 2¼" exposures



With 250mm lens, sunshade, exposure meter knob

With magnifying hood, cut film adaptor and holder



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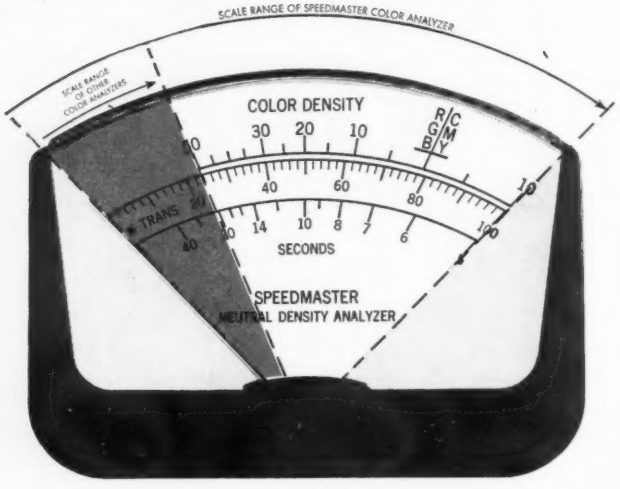

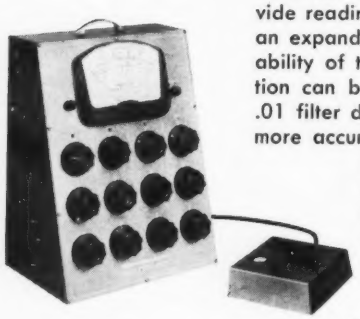

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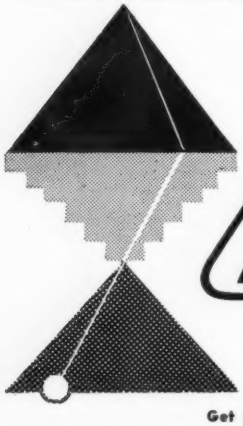

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ELECTRONIC FLASH

(*continued from page* 14)

America Speedlight Corp., Scheibe Engineering, and the Photogenic Machine Co. for information on their standard units. I am sure you could buy commercial units at less cost than you can build them.

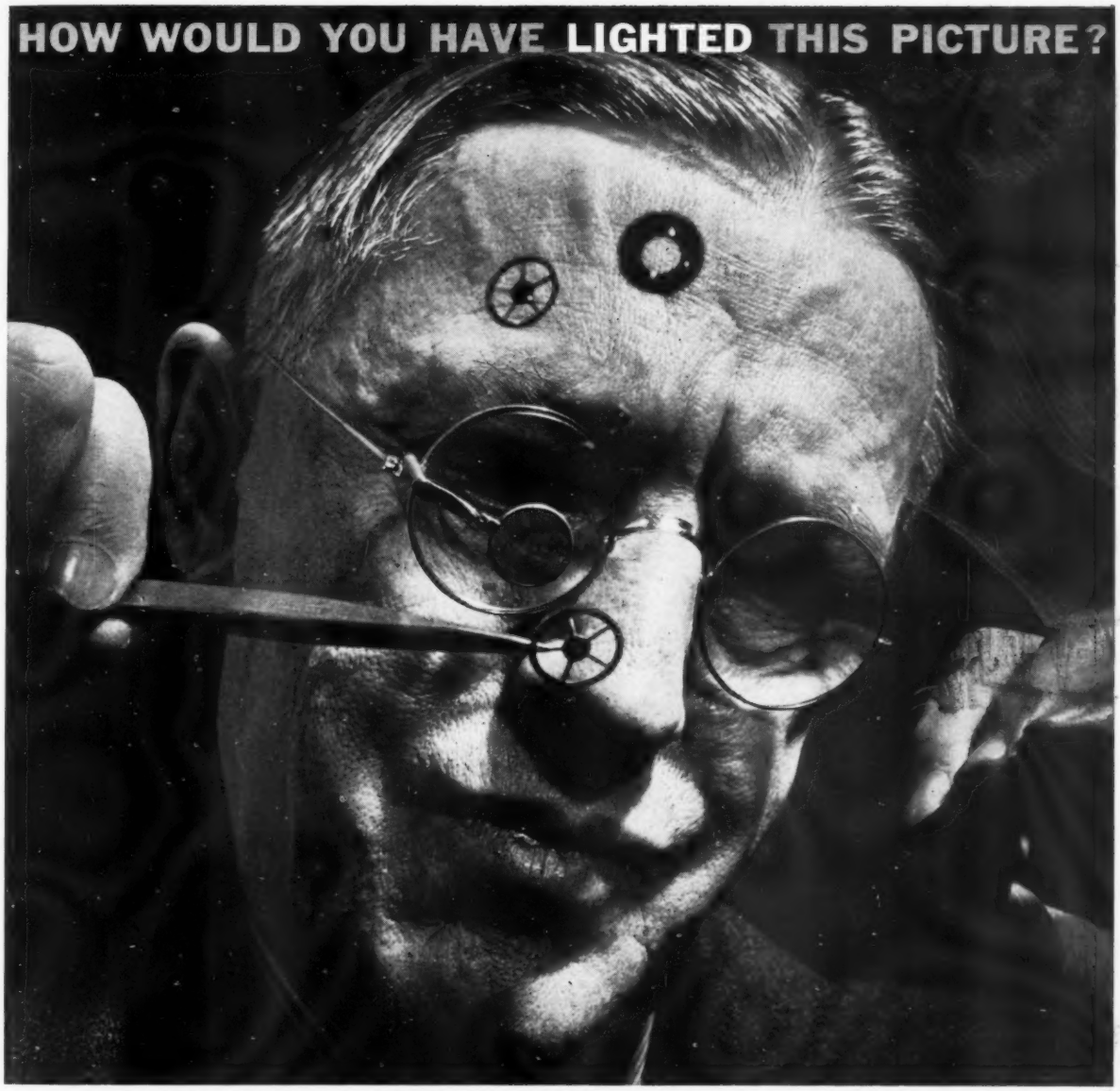
QUESTION: Yours is a most excellent publication. Our one complaint is that we never have time to read all of it. We need to know as soon as humanly possible where bulbs for electronic flash units can be obtained in quantity. We also need to know at what voltages they operate, what length of flash duration is possible, the number of flashes possible before they burn out, if they do, and other information pertinent to their incorporation into a circuit. How much heat do they generate in repetitive use. Any help or "light" you can give us on the foregoing will be appreciated.—T. H., Sulphur Springs, Texas.

ANSWER: Enclosed is a GE Flashtube Manual and literature on Sylvania, Kemlite, and E, G and G flashtubes. These are the principal American manufacturers. This information lists operating voltages and maximum power inputs. Flash duration depends on the loading of any particular flashtube in terms of the capacity of the energy storage capacitor. The number of flashes before failure is likewise a function of loading and also of flashing rate. Suggest you obtain a copy of the book *Flash* (revised edition) by Edgerton and Killian, which has an appendix giving much of the sort of information you desire.

QUESTION: I am interested in building a compact single unit electronic flash based on a monitoring transistorized circuit and operating from a rechargeable nickel cadmium battery, around the 100 watt-sec. range.—L. M., Riverdale, N. Y.

ANSWER: Only suggestion I have to give just now is to see some service manuals on a unit that pleases you in terms of battery, output, etc. You may be able to buy some of the special parts from the manufacturer or his service representative. On page 36 of the March 1961 issue of *Radio Electronic News*, you will find an article "Inside the Electronic Flash" which will provide the circuits of some of the Braun Hobby units. The February 1959 issue of *Radio TV News* and the 1959 edition of *Electronic Experimenters Handbook*, have articles on "transistorized" photoflash.

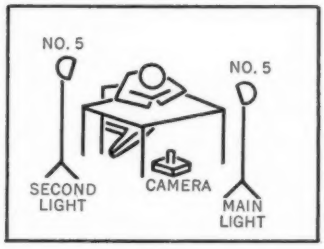
HOW WOULD YOU HAVE LIGHTED THIS PICTURE?



FREE LANCE PHOTOGRAPHER HERB KYNOR TELLS HOW HE GOT A JEWEL OF A SHOT WITH G-E #5 FLASHBULBS

"My assignment was to publicize the 100th anniversary of a jewelry store in Hazleton, Pennsylvania. For my lead picture, I decided on an extreme close-up of the watchmaker at work. I wanted something unusual so I had the subject work with a few watch parts on the top of a glass desk. Sitting on the floor underneath, I put Rolleinar II close-up lenses on my Rolleiflex, stopped down to f/22 and set the shutter speed at 1/125th of a second.

"For lighting, I chose two G-E No. 5 Flashbulbs. The main light I placed about 5 feet from the subject. The secondary light 6 feet away and to the left, masked with two thicknesses of a white handkerchief. The result was just what I wanted—a dramatic picture sharp in every detail. It has always been my happy experience that General Electric Flashbulbs deliver the light the way you want it."



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ASHTON ON TECHNIQUES

Sine waves, and how they may lead to sharper photographs

Since the beginnings of photography, lenses and sensitive materials have undergone a fairly steady process of improvement in many directions. From time to time the demands of users of photographic materials and equipment have called for different directions of improvement. In recent years a good deal of attention has been given to the ability of the photographic process to give sharp pictures. This attention stems, in part from the trend to wide screen pictures in the motion picture industry and in part from the desire of the miniature still camera enthusiast for sharper negatives.

Both the film industry and the still camera user have benefited from recent advances in lens design and improvements in negative materials but so far only the amateur photographer, and to a limited extent the professional photographer, has paid any great attention to processing methods which will give sharper negatives. But two recent papers in the *Journal of the Optical Society of America* by D. H. Kelly, of the research laboratories of the Technicolor Corp., show that the motion picture industry is now also devoting some attention to the possibility of improving the sharpness of their pictures by modifications of processing. (J. Opt. Soc. Am. *50*, 269 (1960) and J. Opt. Soc. Am. *51*, 319 (1961))

Sine-waves and sharpness

In these papers the author offers a method of measuring the image quality of the photographic process as a whole and uses as a basis for his work the concept of sine-wave response which stems originally from work done in television. As you might expect from this the treatment is somewhat mathematical but in all cases is related to practical considerations and the non-mathematicians among us should be able to derive a good deal of interesting and useful information from the second paper in particular.

The possibilities of improving the sharpness of photographs by processing are dealt with in the final section of the second paper under the heading of chemical transfer functions. But before discussing the possibilities hinted at by the author in this direction it seems worthwhile looking at the progress which has been made so far by less scientific research.

Some ten or so years ago an enthusiastic compounder of photographic developers in Germany named Willi Beutler discovered that energetic developers give miniature negatives of enhanced sharpness if some of their ferocity is reduced by using them at much higher than normal dilution. This method has been widely accepted and a number of commercial developing solutions are now available which take advantage of this discovery. The enhanced sharpness which such developers give is due to a development effect which has been known for more than 50 years the so-called "Mackie line" or edge effect. Until this effect was put to practical use in this way textbooks were unanimous in showing it as a processing defect due to insufficient agitation. The effect is visible, when it occurs, at any point in a negative where a high density is separated from a low density by a sharp line of demarcation. The edge effect is caused by the chemical products of the development process inhibiting the activity of the developer on the low density side of the line and enhancing the activity of the developer on the high density side of the line. The net effect, over a very small area on each side of the line of demarcation, is to lower the low density and raise the high density, that is to increase the local contrast.

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(*continued on page* 20)

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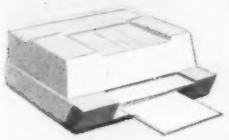

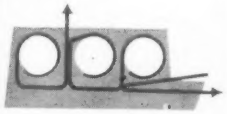

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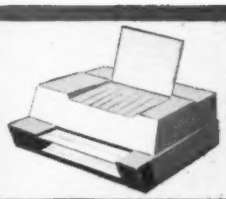

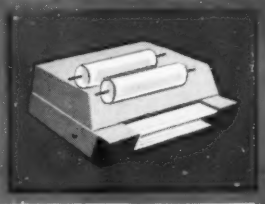

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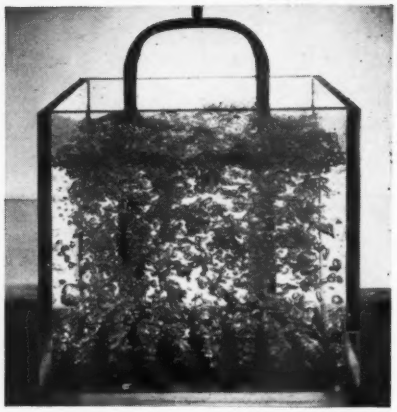
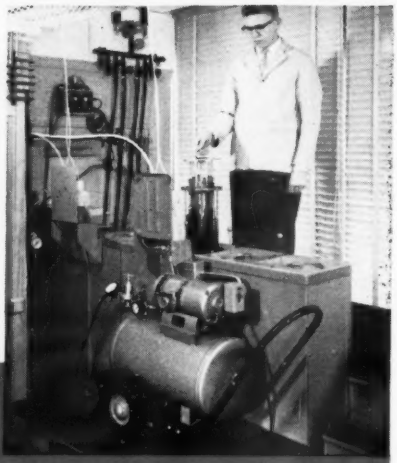
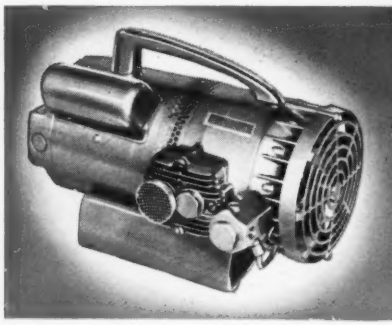




A B&G Oil-less Compressor is basic equipment in Eastman Kodak Company's Photo Finishing Sales Laboratory.



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*One who wastes time loading frames with negatives and waits for proofs

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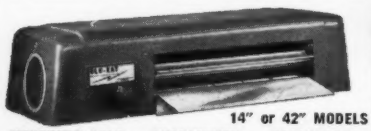

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ASHTON ON TECHNIQUES

(continued from page 18)

is produced by the unsharp masking technique devised for color photography by Yule in 1944 and in the LogEtronic electronic masking printer devised by Dwin R. Craig. The unsharp mask and the electronic printer lower the contrast in large areas in the picture while leaving the contrast in the fine detail unaltered. With proper processing techniques in the remainder of the process this is the same thing as increasing the contrast of the fine detail. And there is no doubt that this gives a much sharper looking picture.

Since the production of these edge effects when they were regarded as a processing defect was due to insufficient agitation, it is obvious that high definition developers which depend on it must be used with less than normal agitation. In addition they should not produce the edge effect on large areas in the picture since if they do the result is somewhat unnatural. When the effect *is* confined to fine detail, as Mr. Kelly points out in his paper, then it goes some way towards compensating the losses of contrast in fine detail due to the lens used in the original exposure and represents a real gain in useful information.

Special processing techniques which accomplish just this desirable result are being studied in the Technicolor laboratory and indicate that it is possible to control the enhancement of fine detail contrast by chemical means in practice. These desirable results are, as might be expected, obtained with films which show inherently good sharpness—fine grain emulsions with lower speed ratings. The techniques being evolved do not depend, as do existing techniques, on restricted agitation and are thus applicable to motion picture processing. During development of some of the materials, for which curves showing the enhancement of fine detail contrast are plotted in the paper, the film samples were spinning on a motor-driven drum which simulates a continuous processing machine running at 90 ft/min.

That these processing techniques have practical value is well shown by a pair of comparative illustrations in the paper where, even though the pictures are reproduced through the medium of a half-tone screen, the difference can be clearly seen.—GEORGE ASHTON

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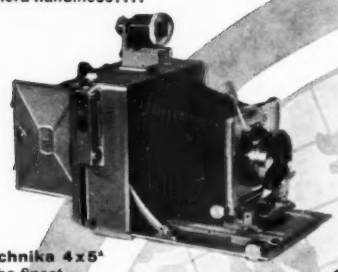

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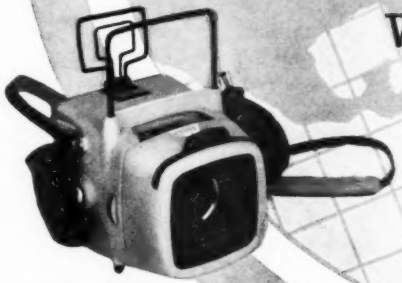

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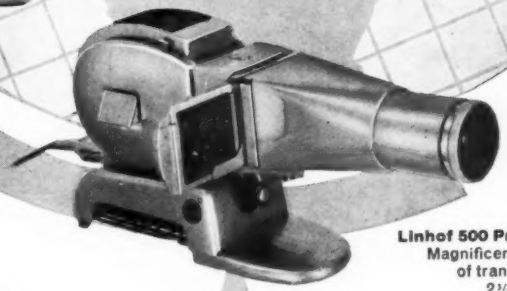

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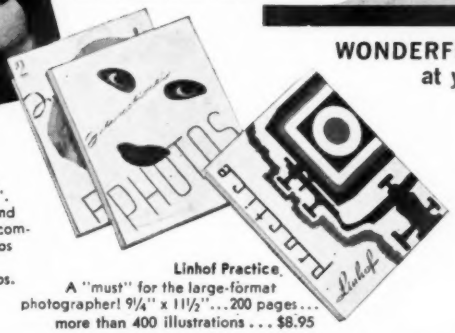

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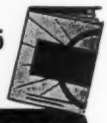

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Samuel Lang & Leonard Zoref

INDUSTRIAL COLOR

Anscochrome makes the space flight; recent technical data

Ansco, we are informed by our morning paper, made the film on which were made the pictures which showed how nicely Alan Shepard reacted during America's first manned space flight. The pictures were 3 per sec. 16mm frames, the film an ultra-speed Anscochrome-type sensitive enough to record an image with two small neon lights, one at each side of Shepard's helmet. A quick check with Ansco disclosed the following details: Anscochrome FPC-132, specially designed for the project, has a film speed of 200/6° which was probably jacked up to 650/7.5° by increasing first and color development about 1.5 times in conventional Anscochrome solutions. The resolution of the film is between 45 and 55 lines per mm. It will become available in 16, 35 and 70mm widths; special sizes, spoolings and corings can be made up.

Meanwhile, back at the lab

The *Ansco Finisher News and Technical Bulletin* for Jan.-Feb. 1961 carries the following announcement: "Recent manufacturing improvements in Anscochrome 16mm, 35mm and 70mm film will produce a slight opalescence in the film as it leaves the final wash. This disappears upon drying and in no way affects the photographic characteristics of the film. The slight opalescence does not prevent evaluation of color characteristics in wet film."

Fielder's choice

In the March issue of PMI, we fielded a question from a reader who complained that he could not maintain corner sharpness when he made 16 x 20 prints from his 4 x 5 negatives. Seems that to achieve the four times magnification he had to use a 5 to 5¼-in. lens and the enlarger could not be hoisted any further above the baseboard.

Corner sharpness is apt to be more of a problem with large blow ups than with smaller ones for the simple reason that the lens must be focused closer to the negative. A lens that will cover nicely at two times magnification will not necessarily do so at four times magnification.

We passed on our shop's answer to the problem: We use a lens no shorter than 180mm for 16 x 20's from full negative 4 x 5's. We got the manufacturer to supply us with a set of extenders to raise the enlarger head an additional 6 in. from the baseboard.

P. R. Perlowin, manager of the Photo Equipment Div. of Beseler, thereupon wrote us to throw cold water on our suggestion. He admits it will work, but only at a possible sacrifice of the rigidity and stability of the Beseler, of which he is justifiably proud. Furthermore, he writes, a new Beseler product makes the "extender" solution obsolete. The product, called Adjus-Table, permits the operator to leave the enlarger mechanism in its accustomed place, while moving the easel up to 3 ft. further away from the lens, at no sacrifice of rigidity.

Store in a cool dry place

Eastman Kodak Co. sent us a paraphrase of the remarks of William Widmayer, head of the Camera Department for Columbia Pictures, published in the March issue of *American Cinematographer*. They relate to the stability of Eastman Color Negative processed images, but undoubtedly could be extended to Ektacolor and Kodacolor negatives as well. The facts help to explain the difficulty of reprinting a color negative some time after the original printing. We quote from the Kodak release: Color motion picture negatives can best be protected by storing them in vaults where temperatures are

(*continued on page 24*)

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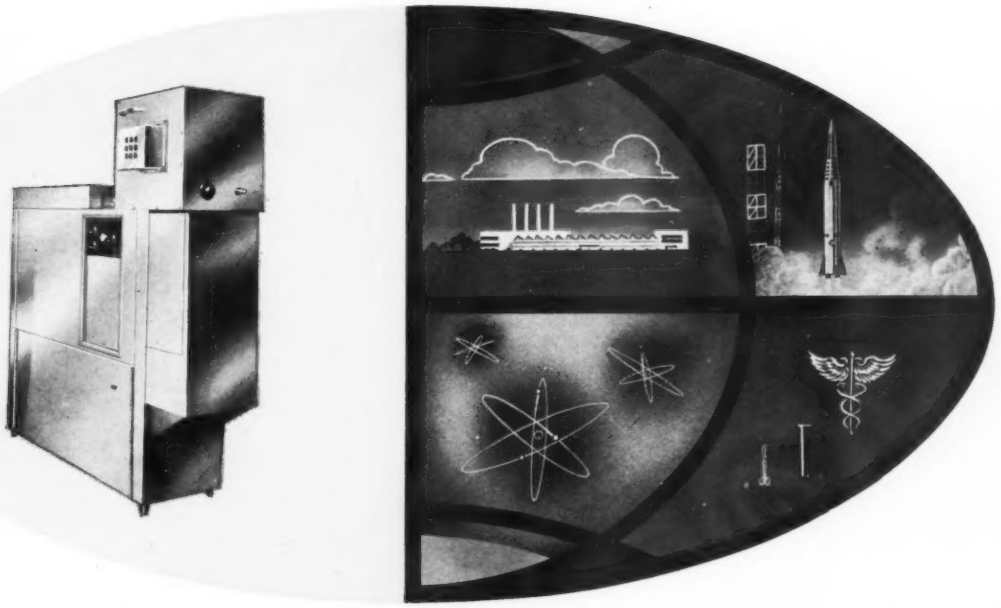

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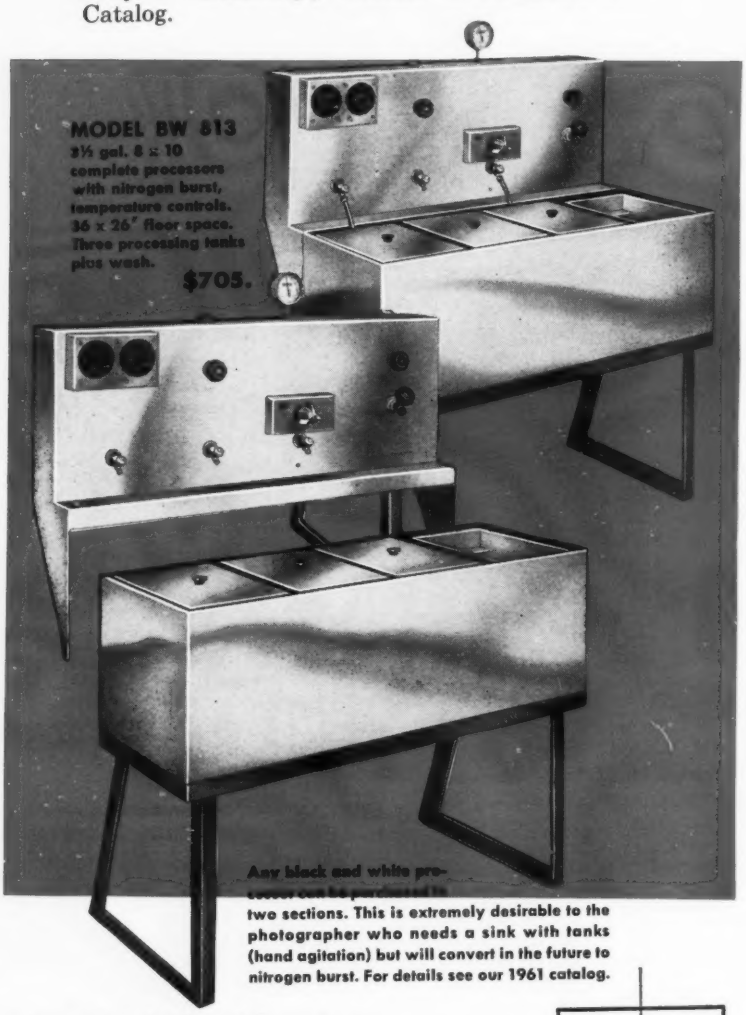

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INDUSTRIAL COLOR

(*continued from page 22*)

controlled at 55 degrees Fahrenheit or below. Dye images tend to fade when exposed to the comparative high temperature and relative humidity of some standard storage vaults. In order to make new release prints the studio or laboratory involved might have to either re-time the conformed color negative footage or make a duplicate from their three black-and-white separations. By storing its own color negatives made on Eastman Films in an air-conditioned vault, Columbia Pictures has significantly cut down the rate of dye image fading, according to Widmayer.

The three basic dyes used in color motion picture films, yellow, magenta and cyan, begin to fade when exposed to excessively high temperature and humidity conditions over a long period of time. The yellow dye is the first affected. The effect noted is a loss of dye density and contrast.

Intersplicing of negative and duplicate negative material—so necessary for creating special effects—on the master negative, complicates the problem because differential fading occurs in this case. The magenta dye in the duplicate negative fades more rapidly than it does in the original negative footage. This makes it necessary for a highly trained film editor to re-time the conformed footage for color balance, a costly and time-consuming procedure.

As long as the original dye density is maintained, the original timing information may be used to produce additional prints.

Dye fading, however, is considerably slowed down when color negatives are stored in vaults where temperatures are controlled at 55 degrees Fahrenheit or below.

The simple procedure of allowing negative film to gradually come up to normal room temperature before unsealing the taped film containers keeps moisture from condensing on the negatives when they are removed from the vault.

A second approach to the "cold" storage of color negatives was cited in the air-conditioning of a standard vault at Pathe Film Laboratories in Hollywood. Pathe installed a one-ton air-conditioning unit in a vault where Eastman color negatives are stored. The unit maintains an average temperature of 38 degrees Fahrenheit and favorable humidity control.—THE END

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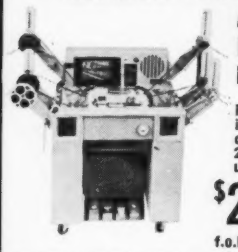

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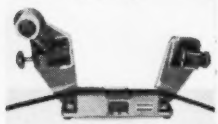

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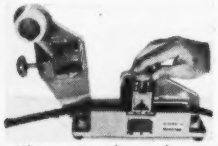
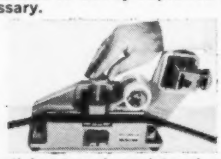


The cutting arm, shown in operating position, is used by pressing the chrome button for cutting both sides of the film simultaneously. The film, of course, has been registered on pins in the horizontal channel. The cutting blade is easily replaced when necessary.



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Arnold Eagle

INDUSTRIAL MOTION PICTURES

Ingenuity, tricks of the trade: the film maker's anti-snafu kit

No film maker is really very good unless he is creative in the broadest sense, but an important part of creativity is ingenuity in dealing with hundreds of unforeseen problems involved in making every film —from a Hollywood extravaganza to the straightforward technical film.

In the course of every film I have ever heard of, there comes a time when one such difficulty brings progress to a halt—where it stays until some inventive person on the set conjures up a substitute shot, a change or a solution. Ironically, the improvisations are often far better than the original plan!

Not all inventions are born in a crisis, of course, and ingenuity is just as important in planning or making do when equipment is not up to the task.

Moving cameras

One of the toughest little jobs in film making is follow focus. It is necessary when dollying in or out, or when the subject advances toward or recedes from the camera. The job usually falls to the assistant cameraman. In dolly shots, to make things more difficult, he must accomplish it while riding the dolly or walking beside the camera where he cannot see or reach the focusing ring. He must adjust the lens to correspond to the changing distance between the camera and the subject, which he must estimate, and he must do this smoothly and precisely. It sounds impossible, but it's done all the time. One of the tricks of the trade is to attach a strip of narrow tape to the focusing ring, and then loop it around the ring. As the assistant pulls the tape down the ring turns smoothly. (I guess this is one reason why they call it pulling focus.) The technique is further refined by calibrating the tape–fixing a special ruler to the camera to indicate how far the tape has been pulled and consequently what distance is focused upon.

Camera movement is basic to cine technique, and in a well-equipped studio the camera is usually mounted on a crane ready for these shots on the director's whim. This is anything but the case on location. The best dollys are heavy, difficult to transport and require a larger crew. As a result, many of the location shots for a low-budget movies and industrial motion pictures have no dolly shots at all.

Often a zoom lens is used to simulate the effect of the dolly shot. It does not do so entirely, unless the subject is two-dimensional (such as a painting) or where a single subject is shown against a plain neutral background. The zoom lens magnifies the image as it closes in on the subject, but the audience does not gain the impression that they are moving toward the action, as is the case with a dolly in, instead they see the increasing effect of "telephoto perspective"—where objects are unnaturally squeezed together front to back. In some cases, the objects in the background seem to rush forward; sometimes the foreground seems to leap toward the background. For this reason I avoid using my zoom lenses as substitutes for a dolly shoot.

Often a little ingenuity in using what's at hand provides a better substitute for the dolly. For example, in nearly every plant or institution, there are dozens of vehicles which provide the means for effective camera movements. A fork lift truck is capable of the slickest type of Hollywood combination movements, provided there is no excessive vibration. Vibration can be dampened if you handhold the camera with the aid of a camera holster. In a plain dolly shot, you can shut off the motor and tow a normally self-propelled vehicle.

(*continued on page 28*)

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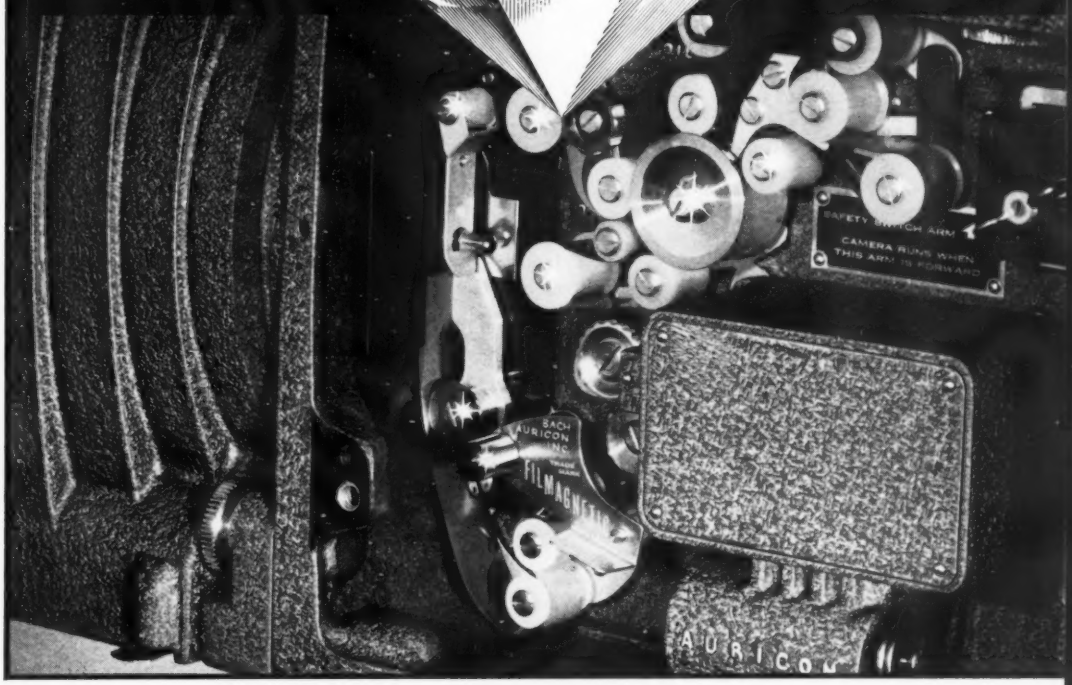

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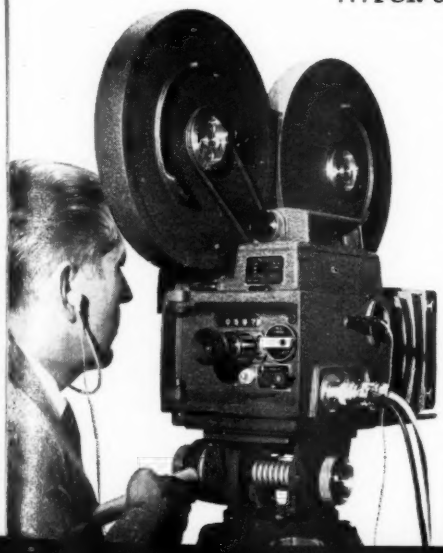

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IND. MOTION PICTURES

(*continued from page 26*)

There are other substitutes: hand trucks, pushcarts, even wheelbarrows.

While shooting a hospital film, I wanted to follow a patient as he was being wheeled into the operating room. I clamped the camera, fitted with a wide-angle lens right on the stretcher bed so that the patient was in the foreground. It was a most exciting trolley shot that no amount of special equipment could duplicate.

In another sequence, I got a very smooth dolly shot by holding the camera to my eye while sitting in a wheelchair. I propped the camera with a unipod against a footrest.

If the floor is very smooth, the vehicle doesn't even need to have wheels. Once I wanted a travel shot of a ceiling. The floor was of polished marble. I held the camera, lay on a rug and had two helpers drag the rug across the floor for some 30 ft. I cannot recall a more relaxed dolly shot!

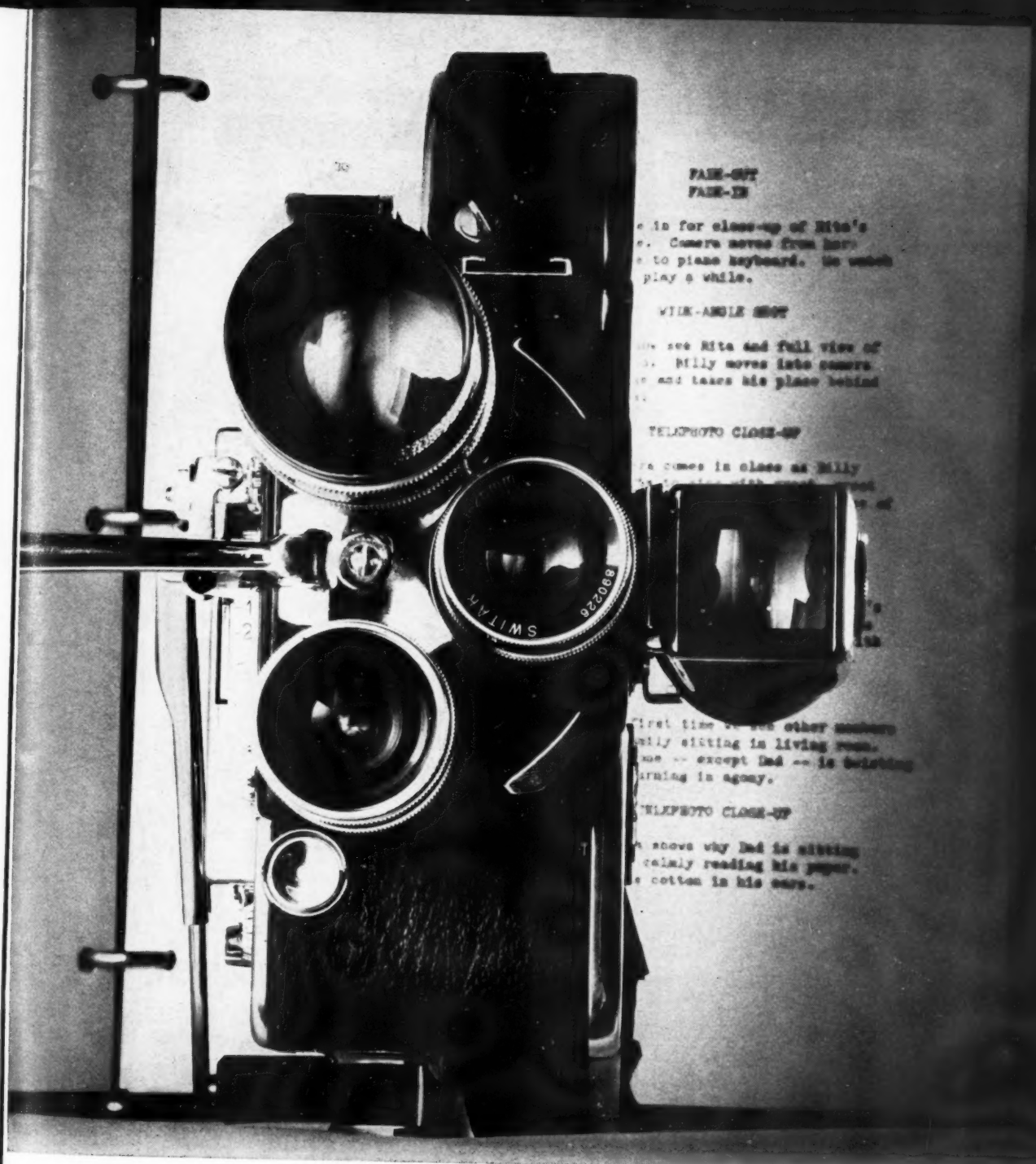
Less air, more care

Outdoors, of course, any automobile can be used for a travel shot. But you must remember to partially deflate the tires in order to smooth out the ride. Naturally, a car with a camera platform top is the safest and most convenient. Both camera and tripod should be chained down, while for short takes, the camera may be handheld—but don't take unnecessary chances by sitting or standing on the fender or roof of a car. No shot is worth a broken neck; I knew a cameraman who was killed that way.

Builders

Ingenuity can be applied to fabricating equipment, the cost of which would otherwise be prohibitive. Christopher Gerould of the Chase Manhattan Bank built a title stand with a surplus 5-ft. drill press, and Lou Jacobs made a half dozen professional animation films on a stand he made from a 40-in. lathe bed. Harry Rothman, a friend of mine, built a precision animation stand using an old x-ray machine stand. These stands have a lot of use around a studio, so if you can lay your hands on one, grab it.

I'm sure that every reader active in films has come up with similar solutions to the problems of filmmaking. If you'd care to share them with other readers, send them in—they'll be acknowledged and credited.—THE END



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AN EDITORIAL

ONE IN EVERY CROWD

The industrialized economy is pretty much built on the efficient division of labor. You don't have to be much of a mathematician to add up a row of figures, nor an expert carpenter to plane a board smooth. There are a lot of people who can do both very well. But by leaving accounting operations to accountants, and woodworking to carpenters and cabinetmakers, we've found that just about everybody does everything better and faster. The division of labor of course has its limitations—some specialties are so specialized that only specialists know they exist—but on the whole it works out very well. ■ While most people in industry are content to leave personnel to the personnel department, common maladies to the company nurse, and floor polishing to the maintenance crew—there seems to be a universal itch to get in on the photographic act. This is understandable because photography is such a widespread hobby. But whenever a company employee abandons his appointed task to take photographs, he's doing the company in. ■ In the first place, non-photographers usually take longer to make photographs of any given quality than photographers. This means that they're wasting time—company time. In the second place, if a highly-paid employee deserts his post to make pictures, the pictures cost the company a pretty stiff price. Much as we regret to see it, photographers are rarely among the higher income brackets. Thirdly, amateurs usually accomplish their results with a good deal of material waste. Finally, helpful as their intentions may be, non-professional photographers don't have the equipment, the practice or the facilities—not to mention the ability—to make pictures as good or as useful as professionals. ■ To non-photo department employees we say, swallow your pride and let the photo department take the pictures for the good of the company. ■ To management we say, make sure your photo department is doing its job, and then save yourself some money by trusting them to do it.

The Editors

"LAST OF THE GIANTS"

A fond farewell to the wonderful century of the steam engine, this film was made by the Union Pacific camera crew as a labor of film. As befits a tribe of giants, steam did not die quietly, rusting into oblivion on a siding.

Its last standard bearer, the hero of this story, was one of the mightiest locomotives ever to pound a pike, a huge 4-8-8-4 articulated. The story of this sentimental journey into steam, written by the man who made the picture—Vincent Hunter.

In the history of every phase of human activity, there is what can be termed a "classical" period, when the basic forms and methods reach a peak of development. From this point, the only path of progress is down. In the history of American rail transportation, this "classic" period is approximately the decade from the late twenties to the middle thirties when the steam locomotive in its highest development was supreme. Un-sleeked by the streamline sheathing of later steam locomotives, lacking the deceptive smoothness of the diesel, steam locomotives represented naked power, visible in every gear, valve, piston. The sound of its whistle, arrogant, yet haunting, set to music many a dream.

Economic facts of life, however, have been the serpents of many an industrial Garden of Eden and the railways were no exception. Steam was great but diesels were cheaper. The king is dead, long live the king!

Not the least of the romantics as far as steam is concerned are railway men who have learned to like the diesel without ever really falling out of love with the steam engine. It was this spirit of nostalgia and a desire to pay a worthy tribute to a once great era that prompted the Union Pacific Railroad to produce "Last of the Giants."

Here, in the words of V. H. Hunter, Manager of Union Pacific's Motion Picture Bureau, is the story of this film, both on the techniques used and of the idea itself:

This picture grew from a very small idea that sort of trickled into my mind one day as I was looking at some rushes on train material with diesel locomotives. As a person will, I thought back a good many years to the days when I first had come on this railroad to go to work. I was 21, and steam was certainly king of the rails in those days. I realized that I'd had many opportunities through the years to put some of this wonderful steam material on film but had failed to do so. This was due largely to the fact that our thinking in our motion picture program was directed more to publicizing the country (and the products) which we served rather than directly pushing the railroad.

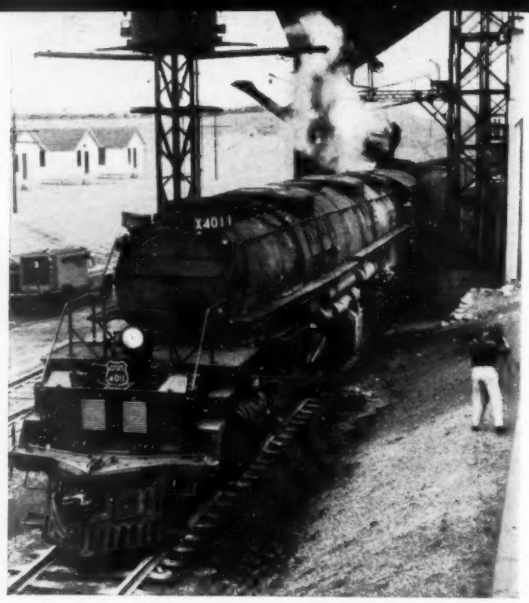
As I pondered on the passing of steam I realized that maybe—just maybe—I had a year or so of grace if I got on the ball. I called Cheyenne and found that they were using a few steam engines during the peak of the summer produce and fruit rush. I had a man doing some filming in Wyoming, so I had him go over to Cheyenne to have a look. He made a few trips over Sherman Hill (the 50 or 60 miles of busy, tough railroad between Cheyenne and Laramie on which we operated steam) and sent in about 1500 feet of film. I had simply told him to shoot anything his fancy directed, just so it was connected with steam.

We projected the dailies on this material and out of the huddle was born the idea of making "Last of the Giants." My boss, William R. Moore, General Director of Public Relations, felt that rather than simply basing the theme on the passing of steam from American railroads, we should bring it a little closer home and build the story around "Big Boy," the 4000-class locomotive which was the largest of its kind—and the last.

Our story line was very simple. We thought we would develop as best we could the reasons why Big Boy was born, what he was, what he did and why he passed from the scene. It seemed strange that such a magnificent mechanical operation should have such a short life span. Yet, the reasons why Big Boy disappeared from the rails were simple and logical. We decided we would present this story in a simple and direct form and try to make our picture interesting not only to adults, but to children as well.

We did not, under any circumstances, plan to make a "Teaching Film," but we felt that the film we had in mind should not be just a superficial account, but should be as solidly informative as possible without lowering the interest level.

As a matter of fact, during the meager planning we were able to do on this picture, we discovered that there was not a great deal of film fare of this nature available on the general subject of railroading. As we progressed, we got the idea that it was quite possible we were working on a film which might have more value 25 years hence than it has today. This possibility



Every move locomotive made was filmed.

Animation talk by (l-r) cameraman Ralph Burrell, Vincent Hunter, MP Manager, and Allan Krieg.

Glen Turner shoots detail of Big Boy. Rag is for wiping dirt from equipment.

brought to us the idea that we should do everything we could to make the necessary explanations of things relative to Big Boy in as clear and lucid a way as possible. It was largely for this reason that we decided to fall back on animation to assist us in our story of the creation of Big Boy and an explanation of how he worked.

Since we never had much warning when steam engines would be in service, we were more or less on call during the summer when they might be used during the peak to augment our fleet of diesels and gas turbine locomotives. The ringing of the telephone presaged someone reaching for camera and bag and heading for Cheyenne on the next train.

Glen Turner of Springville, Utah, who was helping us during the summer, did much of the shooting of this picture and brought to us a creative type of work that added much to the photography. He was assisted by Ralph Burrell of our staff. When we were too short handed, the men in our still department in Omaha came to the rescue by assisting us in any way they could.

After we had about a third of the film shot, we realized that we had another willing worker in Allan Krieg, assistant director of public relations at Los Angeles. Krieg is a real train buff and a man dedicated to a lasting love of steam. He had no previous experience in motion picture work, but he knew his stuff about steam engines and was

soon acting in the dual capacity of director and writer on the picture. Krieg jelled all the general ideas which we had all contributed and got them down on paper.

The actual shooting had to be done in just a matter of days. The boys would just get nicely into the work, or some bad weather would clear, and bing!, steam power would be furloughed for the season. Our operating department was most cooperative in this project, but they were not of a mind to haul trains with steam simply that we might make pictures. Nevertheless, Jim Hogg, terminal superintendent at Cheyenne, smoothed the way for the crew, now and again gulping at some of their requests, more often than not suggesting an easier way of doing something, for time counts in mainline railroading.

We had to catch most of our stuff on the run. And in many cases we had to shoot regardless of the weather. I got a call from Cheyenne one day—a distress call. "We're just sitting up here waiting for weather," our cameraman announced dolefully.

"Never mind the weather," I replied, "Shoot in anything short of floods or tornadoes. We don't care about blue skies in this picture; just get me scenes that will make me smell the steam and cinders and coal smoke and that will do the business. If it rains—get it in the rain!"

For brief spans during three summers, whenever a 4000 series locomotive was in daylight operation on Union Pacific, there was a camerman aboard and/or one or more chasing the big engine in a car. We shot Big Boy pulling trains, shooting the works up a stiff grade, coasting down hill and whipping over the varied terrain afforded by Southern Wyoming. We made yard shots, turntable shots, fueling shots, washing shots and shots of just about everything connected with Big Boy's final days of his reign.

When he pulled up to a coal chute to take on 28 tons of coal or 25,000 gallons of water, there was a cameraman handy to record it. Our crew even followed the giants into the backshop where major repairs are made. Here are shown that strange and disappearing breed of men who worked on these behemoths with tools adapted to the great size of the engines.

When a Big Boy got new tires in a crown of leaping flames in the wheel shop, the event was recorded. Everything we could think of that we could possibly shoot was shot. We had to do it this way because we had not been able to make a definite plan for the detailed picture—we did not know what would be available to us. In making "Last of the Giants" we got the film first and did our planning last—within certain limits.

One thing we particularly wanted to emphasize was articulation—the way the locomotive frame was hinged so it could negotiate curves. We didn't dare ask for a 1¼-million-pound locomotive to be dismantled, so in simple form we decided that we would use animation to explain this, but we wanted to show the articulation in a live shot also. This was done from two angles. First, we filmed from one of the yard floodlight towers, shooting almost straight down as the locomotive passed below changing tracks, then again with the camera set on the ground and the locomotive coming head-on into camera and suddenly crossing onto another track. These scenes clearly show the pilot swinging one way and the boiler another.

Shots of the drivers in action were made by welding brackets to the engine with the camera mounted at the desired angle. Foam rubber under the camera soaked up some of the vibration. I might add there really is *some* vibration on a steam engine. You have to experience it to believe it, but a steam locomotive acts as if it were alive—and that's an understatement. Cameras on brackets were operated by remote control. Some of the camera tricks utilized in making this picture were learned years ago when we had only steam power and were frequently called on by our research department for motion pictures for mechanical analysis.

As much as possible we avoided faking in our pictures. However, in some cases we had to cut some corners. Generally, it was our aim, as we got into the spirit of the picture, to make a film that even our own railroad operating people would approve. We knew these men well enough to know that any blatant fakery would win us nothing but cold stares. We wanted to make a real railroadman's railroad picture. In addition to our own people who cooperated so enthusiastically in this project, we always had the American railfan looking over our shoulder, so to speak. This fact alone is enough to give any motion picture maker the screeming meemies, because the attention of the railfan to detail and accuracy is almost unbelievable—unless you are a railfan.

A couple of examples here: When we ran the work print for Walt Raymond, Road Foreman of engines at Los Angeles, he discovered that the needles on a guage in a cutaway shot showed the brakes as being applied when in the preceding scene the engineer was releasing the brakes. Since we had shot everything, we found the right action in the outtakes. A previewing railfan pointed out a mistake in the animation showing articulation. Krieg was ribbed considerably for he had supplied the animator with sketches and had approved the sequence.

One of our problems was to get good shots in the cab of the engineer and fireman at work. We wanted to get enough light to fill some of the locomotive blackness against the bright light of out-of-doors. We used a portable battery-

(*continued on page 54*)

Despite railfan passion for details, there was room for sentiment.

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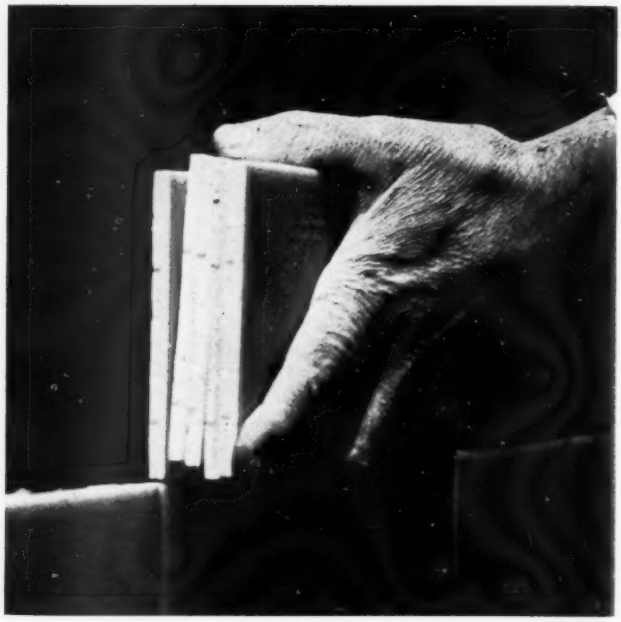

The research: talk to the men... learn what they're about. Watch the hands, and ask what they do... then break the rules and pose them: hands don't wear a silly, self-conscious smirk.

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if you're tight for space...Tadder uses Tri-X Pan at 400– developed in Microdol-X full strength. He likes to squeeze every ounce of quality out of his negatives. He prints on glossy Kodabromide, fusses with dodging and borders, gets what he wants.

Drafting simplified by photography

You'll recognize this picture as a "photodrawing" to which a draftsman is adding modification symbols. This application of "photodrawings" in making plant or equipment modifications can save engineers and draftsmen time and cost. In addition the picture imparts a clearer understanding of the modification to personnel performing the work.

Here's how four Du Pont photo products are used to make a "photodrawing":

CRONAR® Press or High Speed Pan is used to photograph the subject which forms the photographic element of the "photodrawing." This could be a plumbing line, piece of machinery, electrical equipment—whatever it is that requires modification.

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The halftone negative is stripped into position on a negative format—also made on CRONAR Ortho A—and contact printed to CRONAFLEX Contact Film.

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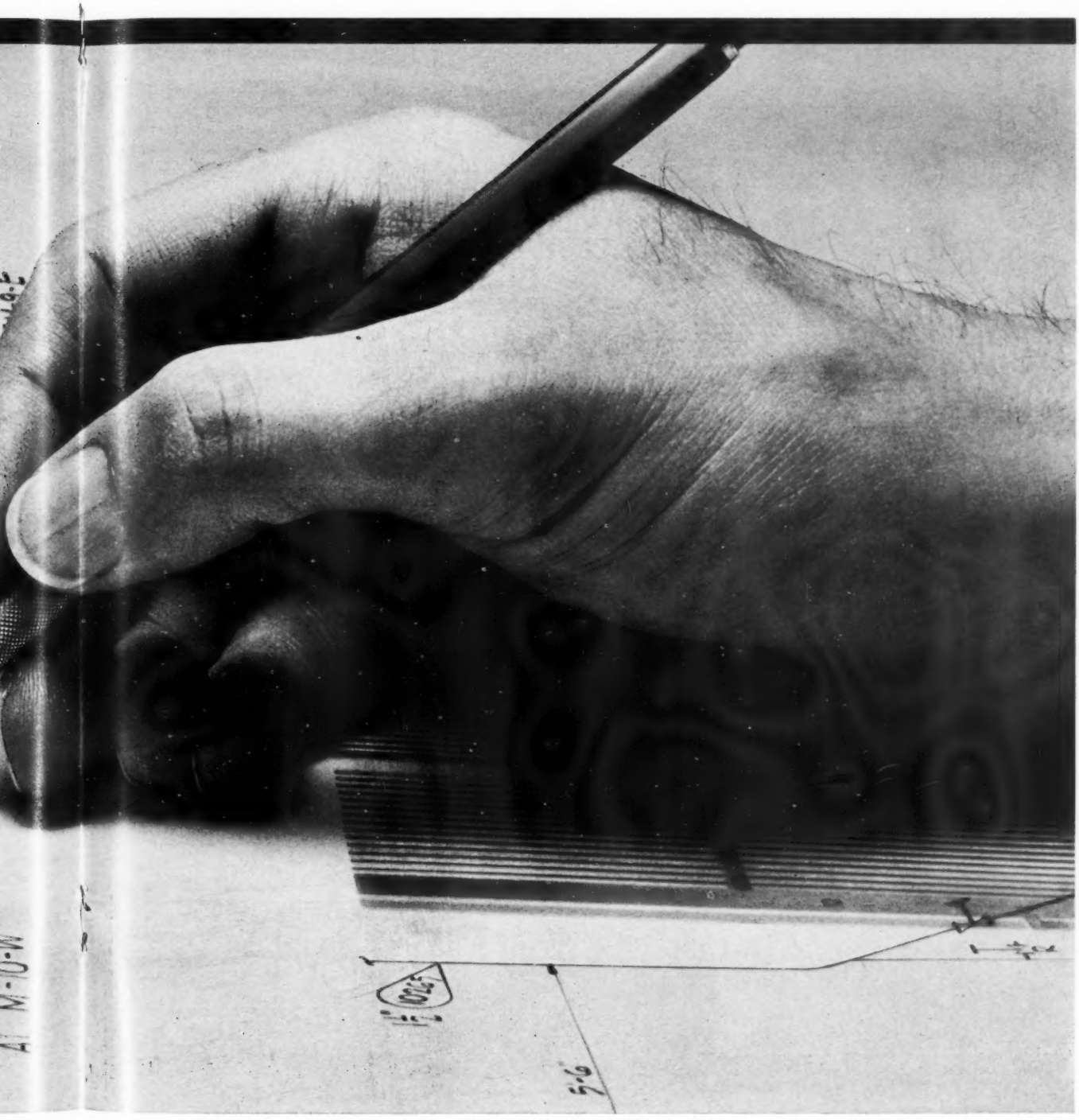
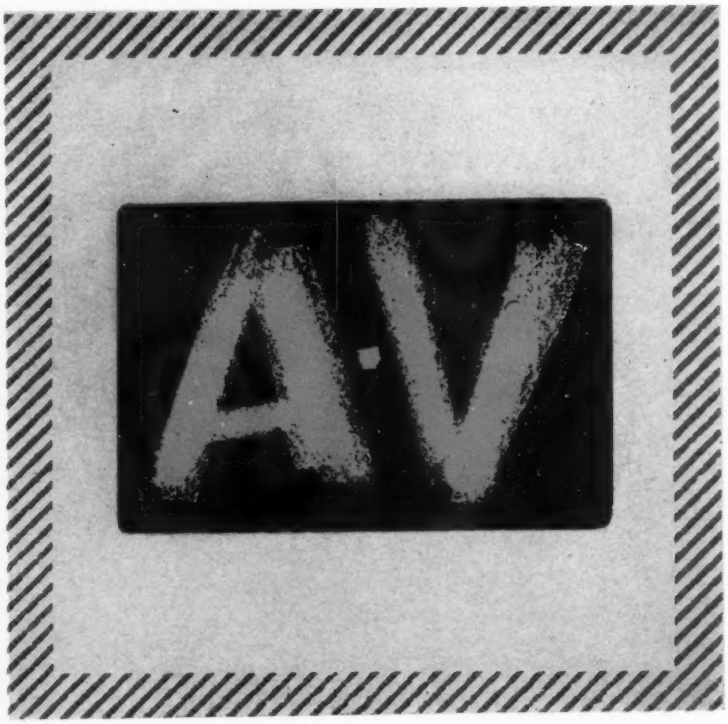




IN THE METHODS LAB

At The Bendix Corporation, Eclipse Pioneer Div., motion pictures and new audio-visual techniques help methods engineers break two costly bottlenecks—the complexity of assembling intricate mechanisms, and teaching the assembly methods. Now Bendix assembly workers and customers learn in half the time ways to do a much better job

John and Lilian Gilbreth were probably the first to think of using photography as a tool for work simplification. In *Cheaper by the Dozen,* the best selling chronicle of the Gilbreth's pioneering in industrial engineering while raising 12 children, Papa Gilbreth hires a photographer to make movies of a mass tonsilectomy he arranges for the kids. His object: better surgical techniques. After a series of mishaps, squeamishness overcomes Papa, and shakes up the photographer. Afterwards, while Papa fumes, the photographer confesses he forgot to remove the rear lens cap in all the gory confusion. Gilbreth thenceforth leaves surgical efficiency to the medical men.

Despite its inauspicious start, photography has an important role in production management. One of the places where it pays off dramatically is in the Methods Laboratory of The Bendix Corp., Eclipse-Pioneer Div., Teterboro, N. J.—where still and motion picture photography reap substantial dividends in two significant areas, cost reduction and employee training.

Cost reduction

Arthur J. Wojtowicz, Time Study and Methods Engineering Supervisor, explains that motion pictures come into their own in the cost reduction program at Eclipse-Pioneer, which manufactures precision flight control, guidance and instrumentation systems for aircraft and missiles.

A cost reduction program, he explains, begins with the selection of a unit where a satisfactory reduction in manufacturing cost seems possible. As soon as this preliminary study is finished, Wojtowicz outlines his photographic needs to Peter A. Carey, Photographic Department Supervisor.

In some cases a member of Carey's group covers every step in the making of a device. In a few cases involving stationary tools, the photographer goes on location, but whenever possible an attempt is made to do the filming in the Eclipse-Pioneer Methods Laboratory. It is supplied with electrical, compressed air and vacuum services as well as facilities for all assembly operations. Shooting in the lab is not only more convenient for the photographer, it eliminates the disruption of a motion picture set on a factory floor.

Rather than absorb the time of

one of his highly-trained motion picture specialists, Carey usually assigns the job to one of his all-around photographers who has been trained on the job.

Carey says that the requirement for the film is quite simple: It must show all the operations, clearly. The simplest techniques are used and costs are cut to the bone. Lighting consists of diffuse, frontal floods. No attempt is made at editing in the camera or after the film (Plus-X Reversal) is processed. Since the study is of no value after it has been analyzed and the manufacturing process changed, no print is made; the camera film is the one ultimately viewed. Any camera can be used for the analysis, but a 16mm Mitchell is preferred if it happens to be available. A 1200-ft. magazine which permits 48 min. of uninterrupted filming is a decided advantage, since some of the operations are hours long. The photographer asks the worker to pause while he changes film, and resume after reloading. One piece of equipment which photo and methods men consider essential is a zoom lens. It permits the photographer to go from an establishing shot (or an operation that ranges over a wide working area) to a detailed close-up without interrupting the worker or moving the camera. The Photographic Department uses a Berthiot Pan Cinor.

Group analysis

A day's shooting is sent to a lab in New York City for processing. The analysis of the first day's film usually commences while the photographer is shooting the subsequent operations. Thus the film has to have enough establishing shots and continuity to be self-explanatory without the photographer's presence. Documenting a process on motion picture film permits it to be analyzed by the entire group of key supervisors. Typically, such a team would consist of representatives from Tool Design, Manufacturing Engineering, Time Study and Methods Engineering, Technical Personnel and Assembly Supervision. This simultaneous review reduces the total observation time and permits free discussion by all, without interrupting production or being interrupted. Furthermore, a representative can document his point by using the film as a demonstration. Each member sees the whole operation, yet can single out

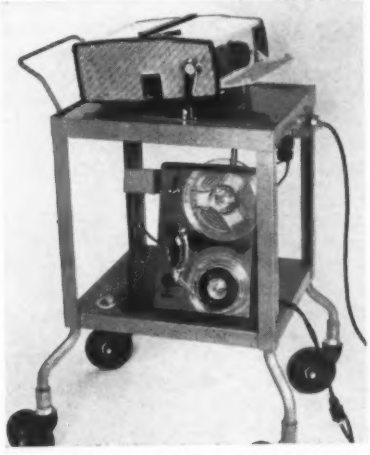
Photography discovers, then teaches, how to do it

Bendix photographer sets camera going in 48 min. analysis of assembly technique. Arri 1200-ft. magazine, zoom lens, aid in getting continuous record for study.

In outlining new assembly technique, methods man, photog, work out slides.

Finished slides are edited for presentation. They must be simple, clear.

Meanwhile, methods men tape verbal instructions that accompany slides.



Vid-E-Aural cart does the tutoring, with taped sound, projected slides.

one aspect for intensive study. Finally there is a permanent record for later reference.

Some of the changes brought about as the result of film analysis include the following: revision of procedures, additional tooling, improvements of existing tooling, revisions in the engineering of a unit to improve quality or reduce the cost of fabrication, establishing case layouts and providing sequential assemblies and providing new drawings to facilitate producing these subassemblies in large lots at reduced costs.

Designing a system is half the story, putting it into effect is the other half, and at Eclipse-Pioneer, A-V plays an even more important role in the application of techniques than in their formulation.

Teaching problems

Wojtowicz' Time Study and Methods Engineering Department had for some time prepared a set of written instructions for each new or revised assembly method. It was the job of a leadman to study these instructions, learn the new technique and train assembly workers in the method. But this system had some defects. Written instructions could be misinterpreted, and the leadmen naturally varied in their abilities as educators. Furthermore, there is a certain amount of turnover in leadmen called to new assignments, promoted, retired or leaving the company. Thus, a replacement would find himself being broken in by a crew to whom he was supposed to be mentor. But the most glaring shortcoming of the system was this: leadmen only rarely could sit down and take an untrained worker through his task from beginning to end even once, much less supervise him constantly throughout the repeated trials necessary to gain proficiency. A worker would get his education in a wasteful series of starts and stops.

A conventional classroom teaching technique might seem the answer, except that only occasionally would there be more than one pupil at a time. This was out of the question. Wojtowicz assigned Methods Engineer John E. Drumm to find a better way to instruct assembly workers.

Drumm learned that a similar problem had been recognized and solved for elevator installations. The installer, working in cramped space at the top of an elevator shaft, would receive his instructions via short range radio from a tape playback-radio-transmitter. The radio bit seemed unnecessary, but Drumm pursued the line of reasoning. After consultations with a number of tape playback manufacturers and with Carey, he and Wojtowicz evolved the idea of a worker-operated portable slide and tape device to give the instructions.

At a trip to an NAVA convention, Drumm located a manufacturer, Synchromet of Jackson, Mich., who could provide him with a tape player that would operate an automatic Bell & Howell slide projector on an inaudible signal.

Carey assured him that Ektachrome slides could be produced for close to the cost of black-and-white prints, and the first mechanical teaching program was developed in August 1958, for the assembly of vertical scale mach number and altitude indicators for the Air Force F-105 Thunderchief fighter-bomber.

There were some questions raised by union representatives regarding the installation of this new technique. The methods staff and the Industrial Relations Department explained that the new system would enable an assembly worker to qualify more quickly for the Bendix incentive program. Meantime, life for the leadman would be a bit easier and he could devote himself more completely to his primary functions. This explanation dissolved any apprehension that prevailed.

Jack Drumm demonstrates an innovation: sound-slide program for groups.

The system was christened Vid-E-Aural, for obvious reasons, and it proved itself to be a smashing success. Both newly hired and transferred employees learned twice as fast with Vid-E-Aural as had similar employees by conventional methods. What was more they could learn at their own speed, and avoid the frustrations of waiting or having to slough over a step that was not completely understood the first time. Instructor's time was virtually eliminated. Variations in method which could possibly affect the final product were eliminated from the start. And, most surprising, the very precise instructions necessary for the recorded programs stimulated many questions about the efficiency of some manufacturing methods and unearthed new ways of introducing cost savings, as well as forcing instructions to be prepared more explicitly, in plainer English.

The system paid off so handsomely that more equipment was purchased and a professional recording studio constructed.

Since this time, Methods learned that similar systems had been devised elsewhere, but they are a lot less concerned about their baby's uniqueness than its immense value in on-the-job training.

Today the library of Vid-E-Aural instructions covers some 200 hours of assembly time, and dozens of jobs. About 10 hours of new instruction is added monthly. The Vid-E-Aural units are in constant use, and assembly workers "plug themselves in," as a matter of course whenever they have a new job to master.

How it works

The Vid-E-Aural system operates by projecting the image on a screen in front of the worker. A hearing-aid type speaker provides the sound. The worker advances through the instructions by pressing a footswitch, listening and watching, stopping the machine, carrying out the instructions, then moving to the next stop. Both hands free for the work.

The system has been extended to a service school set up by Eclipse-Pioneer for users of the flight control systems, and these "pupils" are most enthusiastic about the Vid-E-Aural. Some have tried to buy the units to take back to their companies, but Methods

(continued on page 60)

AV IN USE

HIDDEN CAMERA OBSERVES WHAT MAKES CONSUMERS GO

With the tremendous expansion of self-service retailing, consumer choice is governed, to a great extent, by the packages he sees displayed. Size, shape, color, are all important factors in moving the shopper's hand to take a product from the shelf to the shopping cart. To study the role of packaging, Marathon Division of American Can Company, a package design and manufacturing firm, uses a concealed movie camera.

Hidden behind a pile of merchandise is an Auricon 1200 16mm camera with a 25mm Ektar f/1.4 lens. Operated by remote control synchronous motor at 24 fps, the camera photographs the unknowing subjects from 15 to 30 ft. away.

It catches every movement, every expression, every hesitation, on the part of the shopper. If the decision is unusually quick or slow, an interviewer may ask the customer the reasons, taping the interview on a concealed tape recorder.

Marathon started filming in 1950 and currently has six consumer-study films. These films, in some cases edited down from over 11,000 ft. of footage, are mixed black-and-white and color. Exterior shots are in color while actual test footage, shot under existing light, is on black-and-white. With the development of high speed color emulsions, more work will be done in color. Films are screened before small audiences, generally three or four people including the Marathon salesman. From five to 10 prints of each film are made for showing in the company's eight regional offices.

Pile of material atop soft drink boxes holds hidden cameras to film shoppers

Among the findings of the film study is that customers prefer packages which picture the product, or its serving.

The study not only helps package designers but also records the mysterious consumer at work.

ROVING CAMERAS CONVINCING ARGUMENT FOR ROAD SAFETY

In the more rugged days of this country, one of the best weapons for settling arguments was the Colt .44. Using this method, both the dispute and at least one of the disputants was settled once and for all. Today, photography provides an argument at least as convincing and much less lethal.

Take, for example, an argument between a hot-rodding truck driver and a wandering safety engineer. If a courteous remark fails to turn away wrath, a strip of 35mm Tri-X does the trick. This film was exposed in a high-speed camera, specially-designed by Frank Abell, mounted in the car of Markel Service Inc. of Richmond, safety engineering branch of Allstate Insurance. These cars patrol the highways observing the operation of trucks insured by Allstate, indicated by a black 'M' on a yellow map.

The cameras are mounted on the dashboard and operated by the safety engineer. A dial, showing time of day and speed, is mounted inside the camera and appears in the corner of each frame. When a likely subject is spotted, the engineer presses a button and the camera begins to record. About 600 ft. of film is shot annually. Compared with 5,280 ft. shot in 1955, it reflects the decrease in poor driving habits.

Camera-equipped cars used by safety inspectors for Allstate Insurance Co.

If there is a dispute with the driver, the film is developed within the hour, using a daylight tank, X-33B developer and Edwal fixer. An Argus projector shows the pictures, in negative form, to the driver, effectively discouraging arguments and encouraging safety.

There are 147 camera-cruisers in the United States, showing that, for purposes of argument, at least, pictures can prove the point.

FILM CLAIMS TOO MANY SING I BEEN WORKING ON THE RR

How many men does it take to run a railroad? The answer depends upon whether you are management or union. In these disputes, it is customary for the government to act as a referee. Each side attempts to convince the referee by logic and emotion, that it is right.

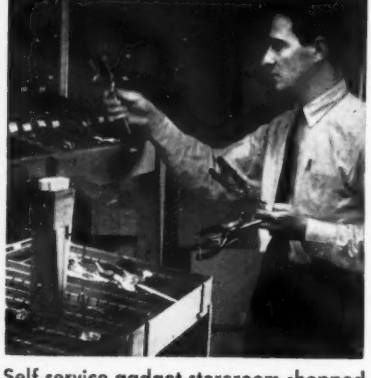
In a recent hearing before a 15-man Presidential Commission to find out what is wrong with the railroads, the Illinois Central submitted a movie to support its contention that less men were required to operate certain trains than were being used under existing work

(*continued on page 70*)

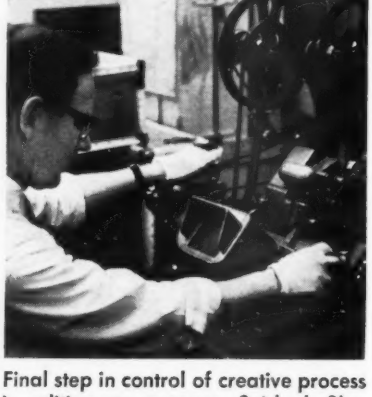
BEL

Dworkin can handle all phases of film work, from writing to editing picture.

Tom Musca, veteran Bell cameraman, reloads Arriflex during in-plant scene.



Self-service gadget storeroom shopped by Friedman for light clamps.



Final step in control of creative process is editing to prepare finished film.

How can the ideas and the work of some of the nation's leading research scientists be translated into terms understood by a college undergraduate? What will bring to life the work of a physicist studying low temperature physics, giving it meaning to a student in Physics 1 who wonders whether or not he should have taken Phys Ed instead?

These are the problems faced by the Educational Film Production Group at Bell Telephone Laboratories, Murray Hill, N. J. The Labortories is the research and development organization of the Bell System, and is owned by A.T. & T. and Western Electric Co. It is one of the major communications research centers of the world, with more than 14,000 employees.

About one third are professional scientists and engineers. The Educational Film Production Group was organized about four years ago, as part of the Laboratories Publication Department, to produce films and filmstrips for distribution to educational institutions. Its mission is to inform students and teachers about the work being done by Bell Laboratories scientists, many of whom are world-famous authorities in their fields.

The group, therefore, has the responsibility not only of turning out good films from the standpoint of the film maker and the educator

TELEPHONE LABORATORIES

This three-man group puts the emphasis on the creative controls in movie making, writing, editing and directing, to produce accurate, responsible teaching films. Photographic skills are hired when needed from free-lance ranks

but it has to make sure these films are scientifically accurate.

Currently, there are three men in the Educational Film Production Group. Film Supervisor is Sol Dworkin, a one-time bacteriologist who learned film making at the National Film Board of Canada. Later, he gained experience with educational films at the universities of Indiana and Syracuse. He has a Ph.D. from Syracuse in Education, specializing in audio-visual methods. Before coming to Bell Telephone Laboratories, he was with Bell Aircraft in Buffalo, N. Y.

The second man in the trio is John R. Friedman, writer-director. An economics major from Cornell University, he went into writing and film making. He worked with Dworkin at Bell Aircraft.

Tom Musca, the third member, is a veteran Labs Motion picture and still photographer. All three men are versatile workers who can handle any of the assignments connected with filming.

The group prepares the script and directs the production of Bell Labs films. Photography, animation, and recording are all done in most cases by technicians who are hired for a specific job. Actually, the group has what might be called "minimum" or "basic" production capability, having enough equipment to handle shooting in the limited Murray Hill laboratory.

In practical terms, this "minimum" capability gives the group considerable flexibility.

From the management point of view, it is more economical, considering the comparatively limited output of the group, to hire technicians as needed rather than to create the problem of a large staff, big overhead and the need to make work.

As things are now, while Dworkin researches a script for one film, Friedman may direct the filming of a second film, while Musca edits a third. These roles change as conditions dictate: Friedman may work on a script, Dworkin may supervise the animation of a film, while Musca may shoot some footage around the Laboratories. In short, the unit tries to keep things simple and flexible. The only factor which remains constant is strict adherence to the highest standards of scientific accuracy.

Because of the emphasis on the writing-directing aspects, production equipment has been kept to a minimum. The only camera now being used is a 16mm Arriflex with a Pan-Cinor f/2 zoom lens having a 17mm to 85mm focal length. There are four extra lenses for the Arriflex; a 40mm Makro-Kilar f/2.8 and three Schneider Xenons of 15mm, 25mm and 50mm focal lengths. The camera is mounted on a CECO Professional Junior tripod with a friction head. Lighting is supplied by ColorTran units which were chosen because of their portability. Exposures are measured by a Sekonic "S" incident light meter.

An animation stand is being installed to handle some of the simpler animation work. A used Cine-Kodak Special was converted for use with this stand.

Other equipment on hand includes a sound 16mm Moviola, an Ampex ¼-in. tape recorder, a Magnasync recorder and a 16mm Bell & Howell sound projector with synchronous motor.

Everything was chosen to satisfy the needs of the group and provide balanced equipment for the work involved. If there is a job that cannot be handled by the equipment on hand, special equipment is rented. If a job demands 35mm, for example, they will rent a 35mm Arriflex; or, if sound is to be shot, a 35mm Mitchell. Any additional items such as a dolly is also rented.

The group makes about three films a year. Actually, each member works on more than one production at a time; so if there is a delay on one production he turns to a second assignment, holding off on the first until the delay is cleared.

The subject of any Bell Labs film is decided by the Film Group, with advice from Bell scientists and the Publication Department.

BELL TELEPHONE (*continued*)

The decision is guided by the type of work being done within the Labs. For example, one of the scientists may be working in a field of great current interest. He will be approached and asked about the possibility of doing a film on his work. Sometimes he will agree and other times he may be too busy; in which case the group will do another film until such time as the scientist has time to work with it.

In general, the films cover subjects which are within the scope of Bell Labs activities. For example, a film on semiconductors might be a logical production whereas one on animal husbandry would be farfetched. Many Bell scientists have taught at colleges or at Bell System schools; sometimes, previously prepared lectures provide the basis for a film.

Many areas covered by Bell research are not amenable to visual presentation. This is particularly true when the subject matter is abstract rather than descriptive. For example, the wave particle nature of matter presents difficulties in illustrating. Even if the film is almost entirely animation, some concepts cannot be easily depicted. So usually, a film subject is chosen that has some qualities which can be shown graphically.

The problems of graphic presentation are worked out by the film makers group with the help of technical and scientific consultants. In terms dear to sociologists, there is group interaction and stimulation.

Scientific guidance is available to the film group. It is felt that scientific accuracy and clarity must be maintained for the film to be useful as a teaching tool. Before work on any production is started, Bell scientists are consulted and considerable research is done by the writer to insure the highest standards of scientific content and educational presentation. Often, the Bell scientists concerned will appear in the film as a lecturer.

The filmstrip, *Zone Melting*, was prepared with the aid of William G. Pfann, a member of the Metallurgical Research Department and author of a comprehensive book on the subject. He helped clarify some of the concepts and approved the drawings used in the strip.

The film *Crystals, An Introduction*, was produced with the close cooperation of Dr. Elizabeth Wood of the Laboratories Research Department. She is a Past-President of the American Crystallographic Association. She helped plan the presentation used in this film.

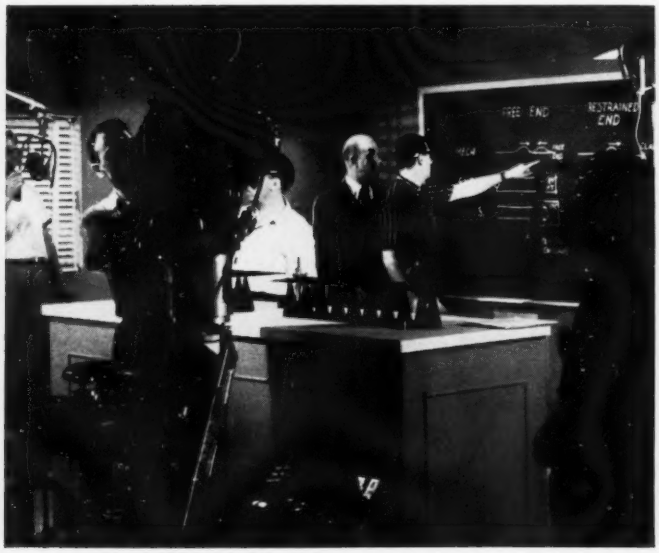
The script outline is prepared with the scientific consultant and is approved by an informal committee of scientists. During this period of script preparation, there is continuing contact with the scientists.

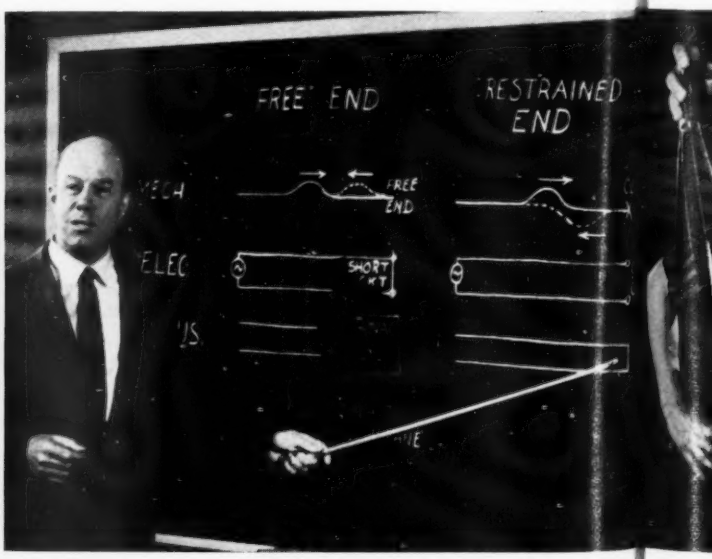
Once the script has been approved, it is ready for production. If it is an animated film, rough animation sketches are prepared by the writer and presented once more to the technical consultants to check for accuracy and content.

Animation is done by such outside producers as Sturgis-Grant or Audio Productions. The writer-director is responsible for supervising the work of these firms, acting as liaison between the scientific consultants and the animators.

Live films, which consist of a fairly simple narrative sequence, may be filmed at Murray Hill, in the unit's studio. If the live production is more elaborate, involving the use of synchronous sound or requiring props or scenery, a sound stage in New York may be rented. Sometimes shooting is divided between a hired crew which does most of the sound scenes and the Film Production Group handling silent scenes. There is no rigid pattern; each production dictates its own logic of operation.

Shooting time varies from one day to several weeks. *Similarities in Wave Behavior* shot on a rented sound stage took four days. Sound may be recorded and added later or synchronous sound may be shot.





John Friedman, directing *Similarities in Wave Behavior* checks blackboard with Dr. Shive *(left)*. Above is scene from film.

If the sound track is added later, a professional narrator may be hired to read the narration. When possible, the group prefers to use the actual scientist, if his voice is adequate.

Sound effects and music cutting are also done by an outside firm such as Picture Scores, although the music is selected by the Bell group.

Editing is done at Bell Labs by one of the film makers. Musca, who is a cameraman, often does the editing after a hired camera crew has done the shooting.

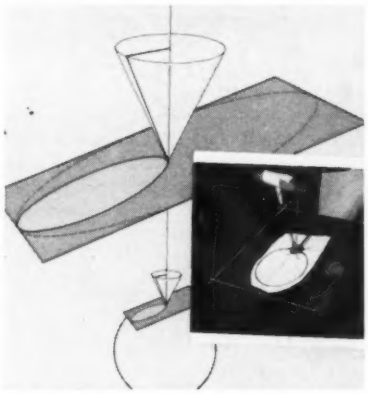
A major factor in the decision to keep the group small is the availability of film talent in New York. Any type of specialist can be hired. Also, it is possible to get the best specialist for a particular job; one cameraman for location work and another one for studio shooting. The present workload is not enough to keep a full-time cameraman busy.

It costs considerably less for the Bell Labs group to produce a film than it would for an outside production firm to produce a comparable film. One reason for this is that overhead and salaries are not charged to a particular film. However, this is not the main reason for Bell's decision to form a company production group. Bell feels that an outside producer can-

(*continued on page 69*)

Dworkin and Musca use Polaroid shot to check model before shooting.

John Friedman suggests action to Bell Lab scientist for in-plant production.



Polaroid photo (*insert*) guided artist drawing light passing through crystal.

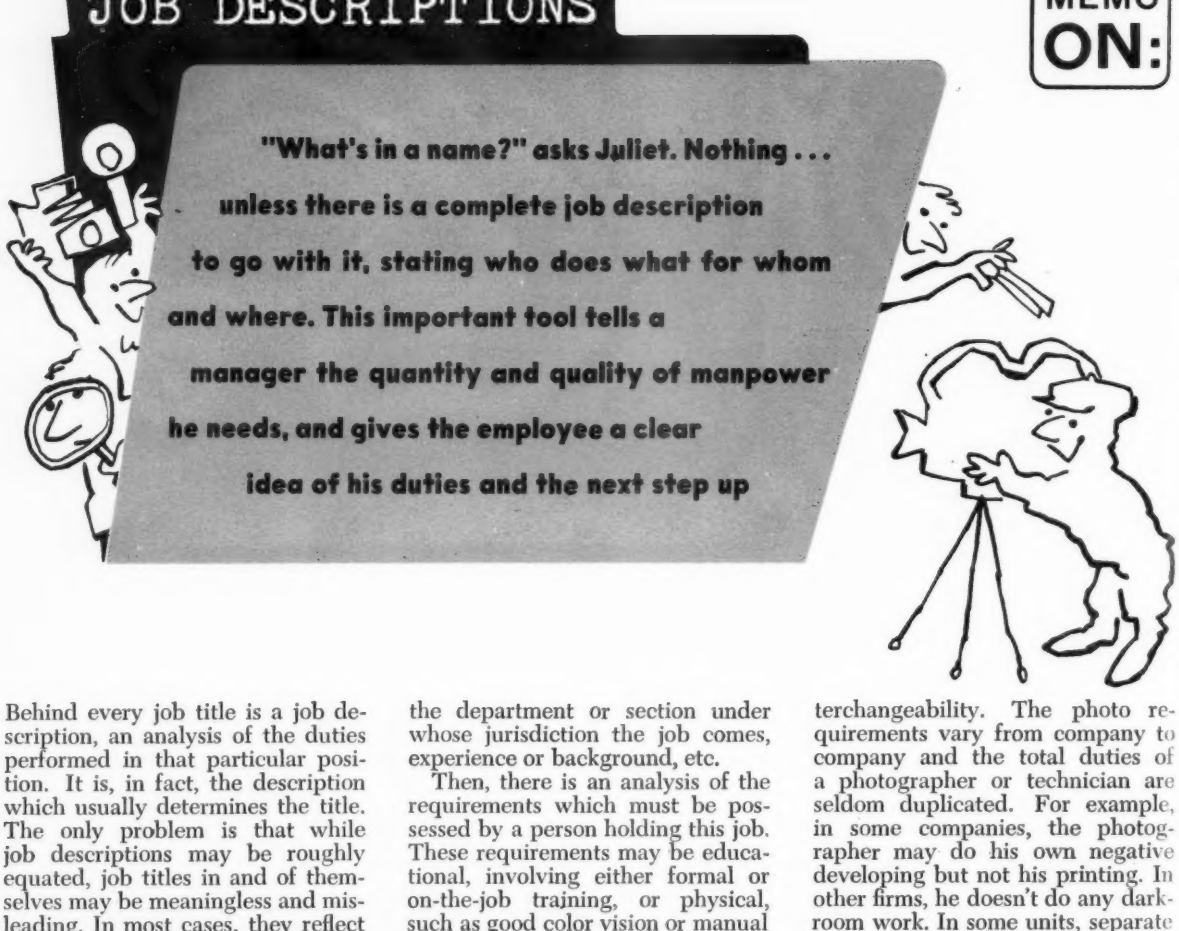
Sol Dworkin, head of unit, works on storyboard for future animated film.

Friedman, cameraman and Dr. Shive examine exposure tests during shooting. Dr. Shive *(above)* is a Bell Labs scientist.

JOB DESCRIPTIONS

MEMO ON:

"What's in a name?" asks Juliet. Nothing . . . unless there is a complete job description to go with it, stating who does what for whom and where. This important tool tells a manager the quantity and quality of manpower he needs, and gives the employee a clear idea of his duties and the next step up



Behind every job title is a job description, an analysis of the duties performed in that particular position. It is, in fact, the description which usually determines the title. The only problem is that while job descriptions may be roughly equated, job titles in and of themselves may be meaningless and misleading. In most cases, they reflect not the job itself but the tradition followed within a particular company for assigning titles.

Some firms minimize titles, others glorify them. Some old line companies call a man a General Foreman and give him greater responsibilities (and, often, rewards) than some of the newer firms which tend to emulate the exalted rank structure of Madison Avenue, where everyone with over two year's service is a vice-president of something.

Thus, it is only by comparing job descriptions that some idea of rank in a photo section can be determined.

Before going into some typical job descriptions, it might be noted that the general form is similar and quite logical. First, there is the detailed description of the work to be done in a certain position. This will include such items as the degree of responsibility and control, the amount of judgment exercised, the department or section under whose jurisdiction the job comes, experience or background, etc.

Then, there is an analysis of the requirements which must be possessed by a person holding this job. These requirements may be educational, involving either formal or on-the-job training, or physical, such as good color vision or manual dexterity. They may be personality traits, such as the ability to get along with people, or, conversely, the ability to work alone and without supervision.

Finally, there is the placing of this job on the pay and rank scale of the company. This is accomplished by evaluating the job and its requirements, then comparing these with similar jobs and similar requirements. This process of evaluation is not completely automatic nor free from emotion. In many cases, the final settlement is a compromise designed to keep both the industrial relations people, who do this sort of thing, and the manager of the department, to whom this thing was done, reasonably content and working.

While some uniformity in job descriptions on an industry-wide basis is possible, photo managers and personnel people doubted if they would reach a point of virtual interchangeability. The photo requirements vary from company to company and the total duties of a photographer or technician are seldom duplicated. For example, in some companies, the photographer may do his own negative developing but not his printing. In other firms, he doesn't do any darkroom work. In some units, separate technicians handle developing and printing. In others, darkroom technicians handle not only all phases of the lab but in both color and black-and-white.

A typical problem in evaluation might be found in a firm whose photographers are largely PR types. Is the ability to tell a story with a camera comparable to the ability to tell a story with words? Should a cameraman with X years of experience and Y degree of skill receive the same pay and rank as his literary counterpart in the Public Relations section? Or should a highly-experienced engineering photographer receive the same pay as perhaps, a Junior Engineer? Virtually every photo department has its own examples of apparent inequities so that there is no need for further examples.

Before going into actual job descriptions, however, it might be pointed out that a proper job de-

scription can do much to remove injustices. List *every* duty and *every* requirement to fulfill the duties of a position successfully. It is not enough to describe a photographer as "Takes pictures using a photographic camera." The more general a job description is, the less useful it will be for analysis or evaluation. Here are some descriptions from representative firms.

One large drug company starts its beginners as *Beginning Photographer.* His duties are to assist in such work as developing, printing, mixing developers. He assists employees in higher classifications and works under their direction. The requirements? High school education, general knowledge and interest in photography and at least six months experience or the equivalent, probably several years as an amateur.

The next step, covering a skilled, experienced photographer, may be listed as *Photographer* or *Camera Technician* or, as in one missile company, *Staff Assistant—Still Photography.* Only the job descriptions would give any idea that these were similar classifications.

Here is how he is described. In one company, "this job is . . . photography of illustrative and journalistic subjects and specialized applications requiring a high degree of skill and to supervise those technicians assigned to assist him. . . ."

Another description

In another, he has "to take and develop photographs of a wide variety of subjects including weapon components, test set-ups, test results, personnel and news events. This work requires a knowledge of still photography equipment, lighting requirements, developing processes and photographic techniques."

A third analysis lists specific duties and approximate time:

"Goes to any location . . . for the purpose of taking pictures as ordered by authorized persons. Must exercise a high degree of proficiency in the use of all types of photographic equipment. . . ." Time involved, 50 per cent.

Other listed duties including printing (20 per cent), copying (10 per cent) and movies (5 per cent) complete his photo time. The remaining 15 per cent of his working time is devoted to occasional supervision of junior ratings and working with other company employees and the public.

A *Medical-Scientific Photographer* "makes still or motion pictures in black-and-white or in color requiring technical knowledge of photographic procedures, as related to clinical and surgical photography . . . using knowledge of medical terminology and laboratory procedures." Qualifications include two years of college with emphasis on science, two years of professional experience and two years of academic photographic study.

The highest rating in this unit, *Chief Medical-Scientific Photographer,* is described as one who "performs tasks which require advanced understanding of, or extensive experience in, a special health science field of knowledge as well as high photographic skill; develops special photographic techniques and processes; may supervise. . . ."

This is a typical example of how higher classifications evolve from lower ones, as experience increases and the element of supervision enters the description. Also, the type of work performed is modified by such adjectives as "advanced understanding" and "extensive experience." It is the presence of these (and similar) adjectives in a job description which form the basis for any discussion on pay or position.

In addition, the extent of supervisory responsibility weighs heavily in favor of more money and a bigger title. By assigning some managerial responsibility to each man in a section, one photo supervisor was able to upgrade all his people.

Job descriptions are not constant but must be revised periodically. In some cases, the revision is due to a change in function of the department; the installation of reproduction facilities or the need to furnish service to departments which formerly used outside service. In other cases, it might be due to a change in equipment as the installation of automatic printing equipment or the increased use of color and the installation of a color processor. This revision may be done either by the manager or by a job-analysis unit upon recommendation of the manager. The rate of revision varies: some basic jobs such as *Darkroom Assistant* may remain unchanged while higher skills, such as *Photographer* or *Printer* may be reexamined and revised every two or three years.

While the actual function of a job desciption varies from firm to firm, it can help the people within a section understand the relationship between their jobs and the section as a whole. It can tell them what skills should be acquired for advancement. It can tell them what

(*continued on page 60*)

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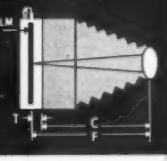

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LAST OF THE GIANTS

(*continued from page 35*)

powered light in one attempt at closeups, but it didn't work very well. So a portable gasoline-driven generator was mounted on the tender. With the 500 or so watts it gave us, we managed to get enough light to get by. We did not, at this time, have the fast color emulsions now available.

We had one particularly interesting shot that worked out quite well. We wanted to shoot the imposing front of Big Boy and in the same scene show the whole locomotive. How to do it? We put the camera on a tripod mounted on a section car and weighed the section car down with sandbags to give it more stability. Big Boy was placed on the turntable, heading to the camera. We started grinding in a full shot and then as the turntable started swinging Big Boy into a quartering view, we started pulling the section car up the track whose rail joints were smoothed out with toilet paper stuffing. By this means we achieved a creditable dolly shot as the great engine swung into a complete side view.

In another instance we did traveling shots of the locomotive by riding alongside on another track, shooting from an inspection car. These shots had considerable vibration and saw little use in the picture.

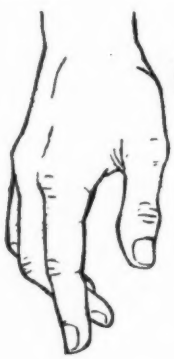
In three summers we had a total of less than 20 days of shooting, and piled up a total of about 8,000 feet of film. Many scenes in this footage were duplicate takes so we had probably less than 5,000 feet of usable film after we had weeded out unwanted duplicates and other film that for one reason or another was unusuable for this picture.

With the shooting spread over such a long time, we experienced one particular disadvantage – and one marked advantage. First, we would be away from the film almost a year, and then it took a lot of projection of existing dailies to bring the theme clearly to mind again, notwithstanding the amount of notes we had on paper by this time. However, we did have the advantage of being able to study the film at length and to correct our mistakes the "next summer." This method may be an amateurish approach to making a motion picture, but at times it presents some very definite benefits over a hard-and-fast script or outline from which there is no deviation. We were able to roll with the punches, change things as we went along and to eliminate sequences that offered insurmountable problems.

In another case, we needed some way to get across to the viewer the tremendous size of one of these engines. I suggested lining up one or more fire trucks alongside a 4000. The Cheyenne firemen cooperated fully, but in the dailies their long trailer rig showed up as such a curiosity that our main idea was lost. Such was the case, also, in any running shot: the action of the rods and driving wheels was so interesting, one neglected to watch the rest of the locomotive. The shot we used was one of those lucky ones that only a cameraman with film sense can bring back. While on the floodlight tower shooting the articulation scene, he spotted a train leaving the yard. He tilted down on the top of the locomotive as it passed directly below. The resulting footage shows a frameful of steam engine that seems never to stop passing.

There came a day when we figured that we had better say that

(*continued on page 56*)



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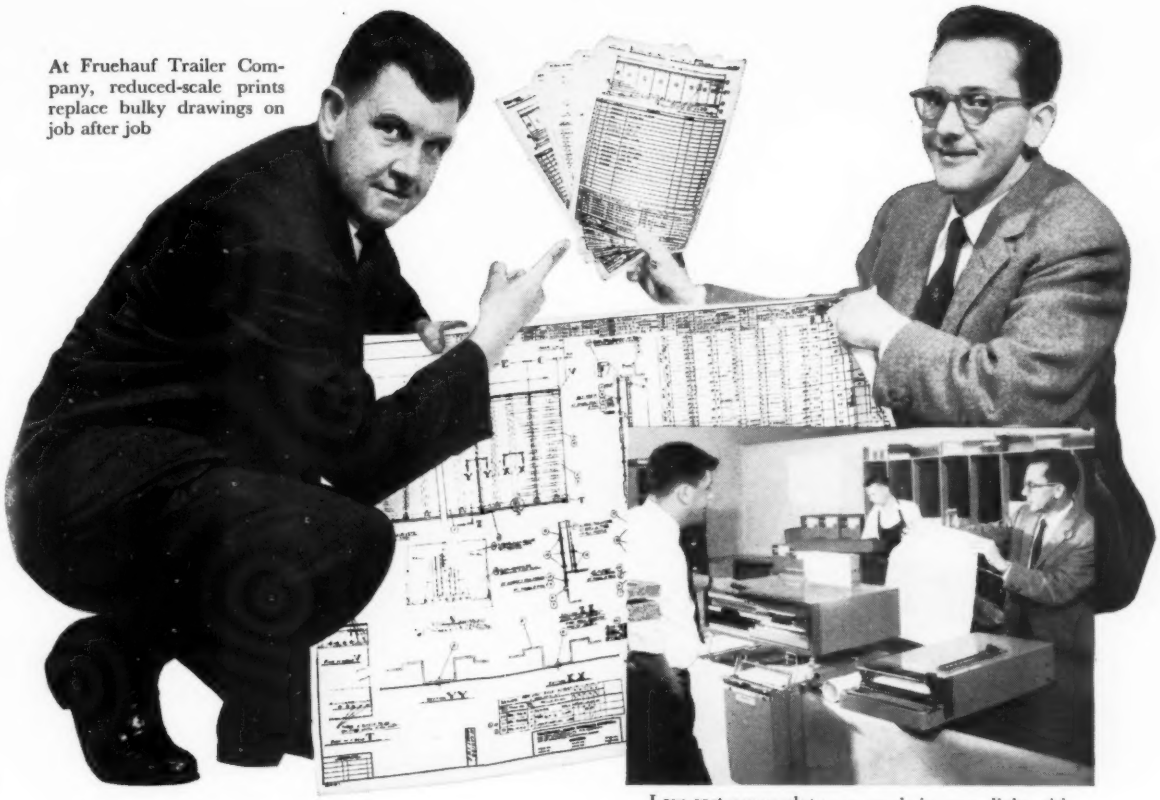

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Fruehauf likes the way the Ektalith Method faithfully reproduces fine linework and solid areas . . . and the savings which result from using reduced-scale prints on a wide variety of jobs. For example: Ektalith-made plates produce (1) Vellum copies for use as print-making masters; (2) Sales manuals and standard parts catalogs, which include halftone illustrations; (3) Production engineering schedules of data on "photo panels." *Plus many other jobs.*

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LAST OF THE GIANTS

(*continued from page 54*)

we were finished shooting. Richard Harrison was called in on the editing job, but before this actually commenced, Director Krieg spent many hours going over film on the moviola, eliminating scenes and boiling the film down to about half the footage.

During the editing, the animation was completed by Anna Osborn. With a clever little animated sequence, Miss Osborn took us back to the early days in France when Anatole Mallet invented the articulated engine. Other animated sequences illustrated the advantages of the articulated engine in rounding curves, and the difference between the simple and compound engines.

The problem of communicating the technical aspects of locomotives to the artist was solved with photographs of Mallet's original engine and drawings of steam engine innards Krieg had dug up out of his library.

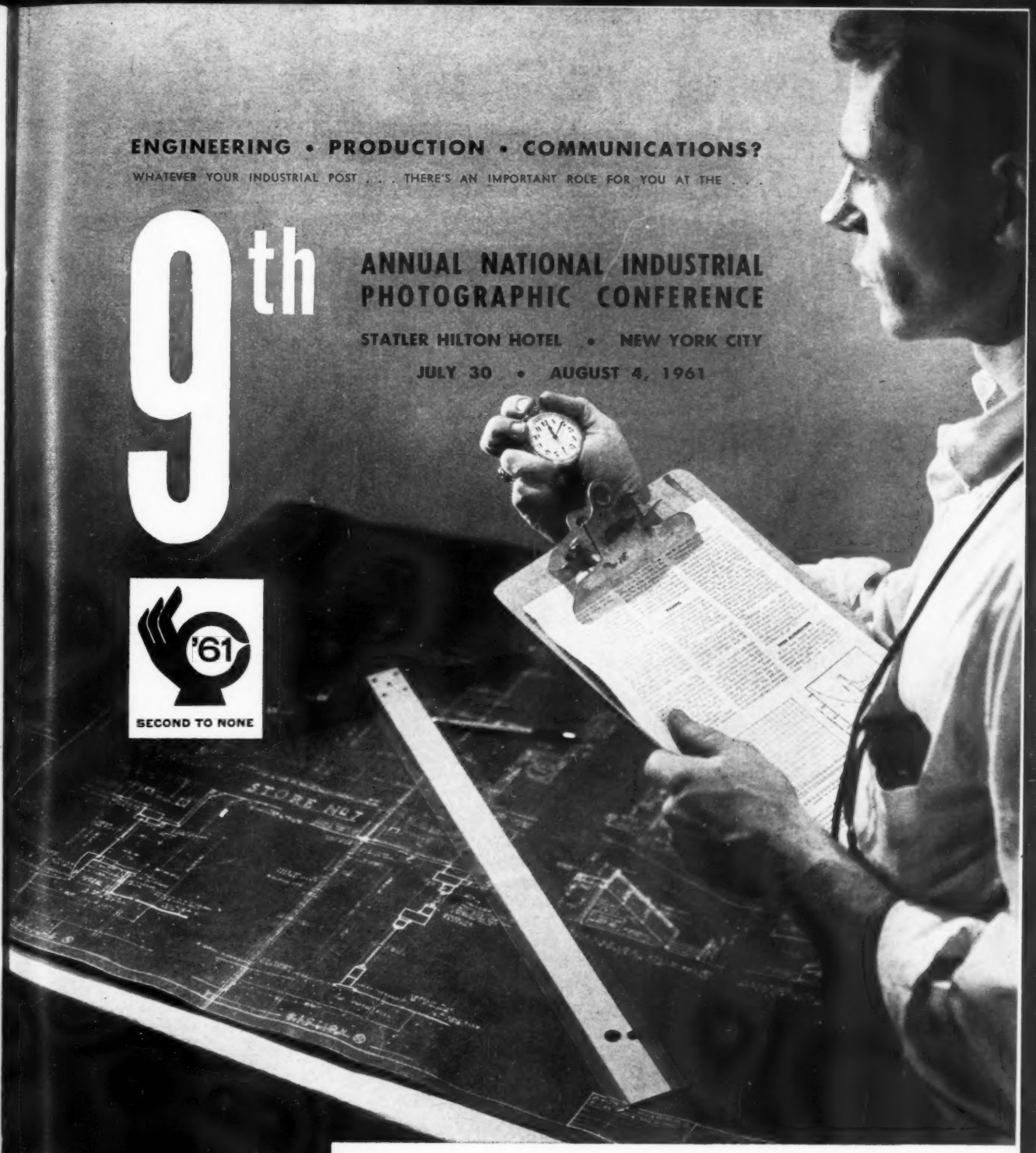
Animation was kept as simple as possible so that we could shoot it ourselves on a simple animation stand which we had built and which incorporated the use of a Maurer camera with a Richardson single-frame motor.

A major part of the production job involved the sound effects. I have always been a believer in the theory that sound effects should be kept to a minimum. Used generally to promote realism, they, more often than not, in the documentary type picture, provide more of a distraction. Generally, I think music is more effective in setting up appropriate sound than (realistic?) effects. But in this picture, all this thinking went out the window very early in the work. Krieg took a tape recorder to Cheyenne and made a lot of train sounds. Later, in Hollywood, these were augmented with special sound effects.

We had to be careful in connection with effects that proper sound be used since we wanted to escape any condemnation from our railroad co-workers who know the difference between the voice of an 800 class locomotive and that of Big Boy and so on.

Edward Ripley, member of a railfan group known as the Railway and Locomotive Historical Society, heard of our search for sound and offered help. Ripley had spent much time with a tape recorder along our line in Wyoming. He

(*continued on page 58*)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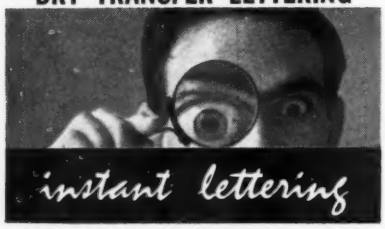

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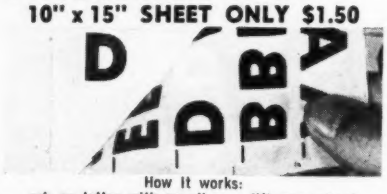

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LAST OF THE GIANTS

(*continued from page 56*)

viewed the work print, went home, and after hours of auditing, produced a duplicate tape he thought would fit many of our scenes. It did.

Some of the recordings Krieg had made were disappointing because, although they were accurate, they lacked "color". Krieg, after considerable listening and discussion on the part of all of us, thought he could fix up the effects we wanted to use to make them more dramatic. He spent the better part of a week working with two tape recorders, a cardboard mailing tube, a vacuum cleaner and other varied sound-producing machinery. Taking basic sounds from the original tape, our budding sound expert superimposed other sounds on a trial and error basis until he finally came up with what you hear in the picture.

Most troublesome were those scenes in which no existing taped "puffs" matched the visual "puffs" from a locomotive smokestack. Krieg found that short, open-mouth breaths into a plastic kitchen funnel approximated the sound, and that if the mike were held near the running projector while he was huffing and puffing, the composite had a locomotive's whining electric generator, to boot. Where the puffs were not quite sync, sound effects editor, Bill Keith, stretched or compressed them. He did as well when mating the clanking of connecting rods to closeups of driving wheels after the mechanical department had told us the clanking occurred on the last half of the piston's backstroke. A locomotive turntable tape re-recorded at half speed sounded like a wheel lathe, this reduced by half again, sounded more like a coal chute in operation than the tape of the real thing.

As a group we are a little sensitive about these sound effects because we are only too aware of the somewhat zany procedure employed to produce them, but in the finished picture there are only a couple of places where we squirm a little. Generally, with the possible exception of a few scattered railfans, no one seems to notice these shortcomings. In the final analysis, there wasn't much room for effective music. It was used sparingly and only where it could give us a real assist.

The script by this time had been checked for accuracy by no less an expert than D. S. Neuhart, Union Pacific's general superintendent of motive power and machinery at Omaha headquarters, and by W. B. Groome, superintendent of the Road's California Division. The latter, a railroad history enthusiast as well as a top-caliber railroad operating man, made valuable suggestions from his mental file of dates and quirks of particular locomotives.

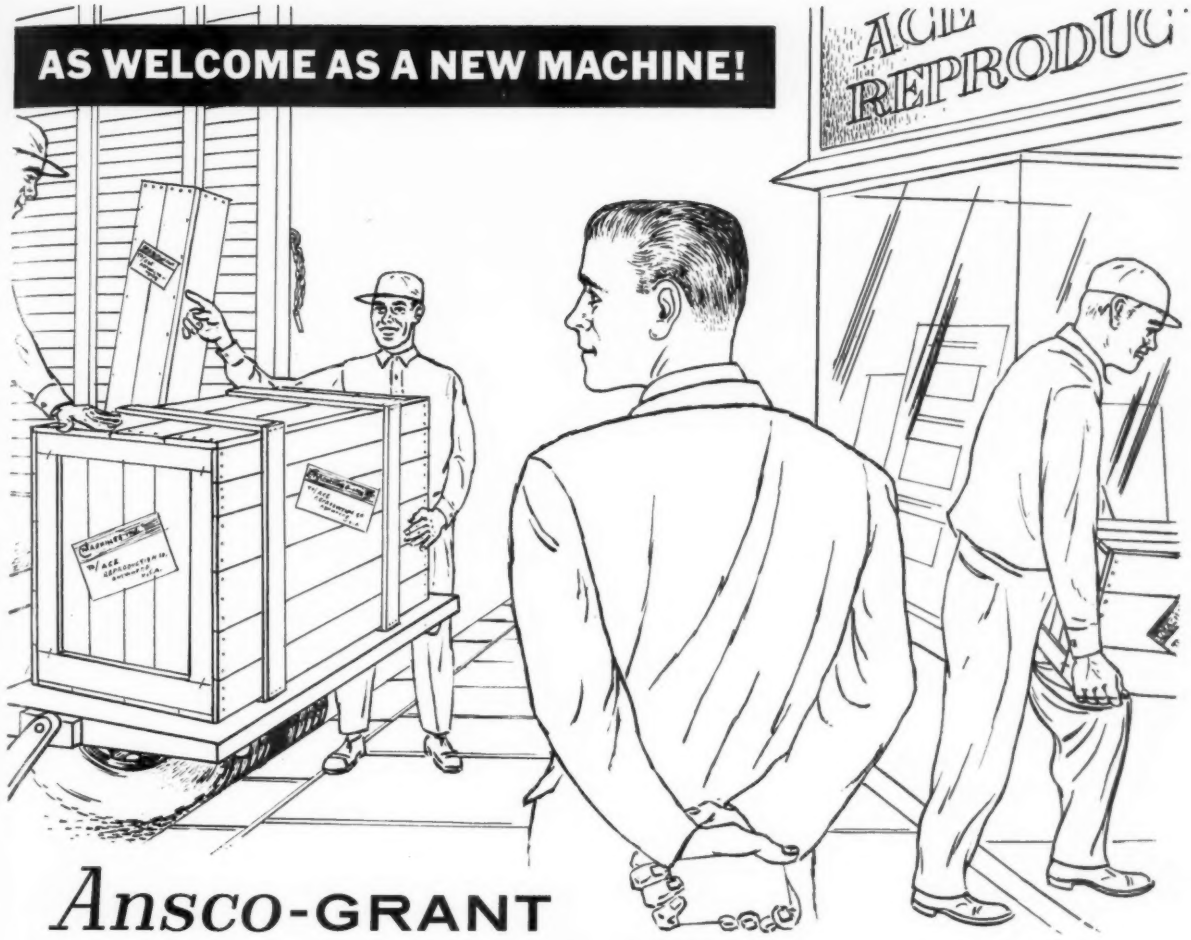
Commentary also stood quite a lot of rewriting to get just what we wanted with just the proper note of nostalgia. We were, in reality, glorifying the age of steam power which passed from the scene because of a better system of motive power. Nevertheless, in both picture and commentary, we wanted to get across the grandeur and majesty of these great engines which closed out a page of American Railroading that for pure romance will never be equaled.

Railroading can be about as tough a business as you can find. It breeds some tough-talking men, too, who can dish out ruthless criticism of anything phony from the creative side such as one depiction in a theater film showing one engineer at the throttle from New York to San Francisco. We walked way out on the limb one day to show the work print and read the script to our vice president of operations, E. H. Bailey. He got up, sniffed and said, "I can still smell the smoke. You've done a good job, boys," We knew then we had the picture we wanted.

Dubbing this picture gave the experts at TV Recorders a pretty good workout. A trial run on sound effects with picture established the fact that we would be wise to predub all the effects. This was done so that all sound effects could be put on two tracks.

A last huddle just before dubbing disclosed the fact that dialogue was going to hurt us on several of our pet sound effects. We did a little recutting of the dialogue track to delete some commentary and shift a few lines forward or aft to clear some sounds we wanted to bring up in greater volume.

About three and a half years from the time we first started to shoot "Last of the Giants", we called the job finished with a 28-minute picture. It's no epic, but it is, we think, a fairly creditable record of an era in American railroading that has vanished into time. As a matter of fact, we just got under the wire with this picture of the last days of the Big Boy. We couldn't make it today.—THE END



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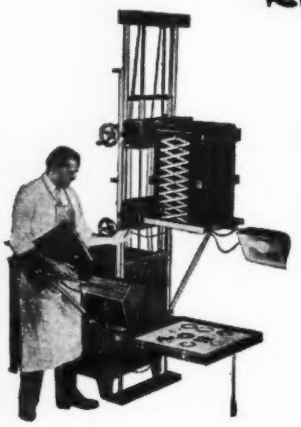

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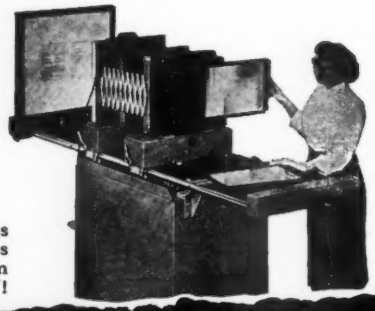

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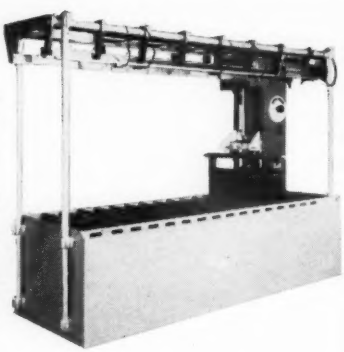

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A-V METHODS

(*continued from page 46*)

needs every one they have. This interest on the part of the E-P customers who have tried out samples of these factory training programs in their own overhaul shops, indicates that the day is not very far off when Audio-Visual programs will be supplied with complex flight systems to assist with field training.

If an operation takes 4 hours of assembly time, it takes 80 hours of time for the methods engineers, photographer and artists to prepare the program. The total time of taped instructions is much less than 4 hours since the operator stops the machine to perform the step after listening to the instructions. The entire preparation is done on the premises.

Generally the photographer uses diffuse lighting for the pictures, relying on color contrast for rendering detail. A reflex 35mm camera is the favorite instrument. Ektachrome E2 Type B the favorite film. In many cases dupes are made by shooting extra pictures. The film is processed in the Photo Lab and mounted in Lindia mounts.

Usually there is at least one shot made whenever a new element enters the scene, and the old motion picture technique of long shot, medium close-up, close-up is employed liberally. Backgrounds are kept as simple as possible. Colored pointers are used to call attention to important details. Occasionally, art slides are used.

The guiding principle, says Drumm, is to write and illustrate the program not only so that it can be understood, but so that it cannot be misunderstood. He's proved his point.—THE END.

MEMO ON MANAGEMENT

(*continued from page 53*)

skills are needed for top performance on their job and which ones they should develop.

The role of the manager in drawing up job descriptions varies. In some firms, he may draw up the description without any contact with personnel people. In other firms, he may serve as consultant to job analysts while in other firms, he may find job descriptions prepared independently by the Personnel unit. Whenever possible, however, he should see that the descriptions provide a complete and accurate picture of every job in his department.—THE END

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Herbert P. Paschel

GRAPHIC ARTS

RH, what it is and what it does to film, flats, plates and paper

The average graphic arts technician is aware of the need for accuracy in measuring and controlling time, temperature and light intensity. These three factors are of equal importance in a duplicating section though not necessarily so in all departments. There is, however, one additional factor common to all departments which, in most cases is often overlooked. This fourth factor—relative humidity—can be the cause of trouble, direct or indirect, in every department of a duplicating section. While abnormal humidity conditions can be troublesome, variations in the atmospheric moisture content in different working areas are even more so.

Exactly what is meant by relative humidity, and how does it influence operations in a duplicating section?

4+4=100

Relative humidity is the percentage of the amount of water vapor (moisture) in air compared to the amount it could absorb. At normal atmospheric pressure a cubic foot of air at 70F is capable of holding approximately eight grains of water vapor. This is a condition of saturation, or 100 per cent. When the same volume of air, at the same temperature, contains only four grains of water vapor, the relative humidity is rated at 50 per cent since the moisture content is only one-half of capacity.

Relative humidity is obviously linked to air temperature since warm air has a higher capacity for water vapor than cold air. Thus, if the temperature is raised without adding any water vapor the relative humidity is decreased. Conversely, if air temperature is lowered without removing any water, the relative humidity is increased.

Air is not the only substance capable of absorbing moisture, and therein lies the problem. Many of the materials used in a duplicating section are absorbent and will thus be influenced by humidity conditions. Paper, film, offset plate coatings and the like are all moisture sensitive and will absorb or release moisture according to the surrounding relative humidity. If drier than the surrounding air they will absorb moisture: if wetter they will release moisture to the air. In achieving balance with the moisture content of the air, such materials as paper, film and light-sensitive colloids obviously vary in their moisture content. Such variations introduce changes in the physical and chemical reactions of these materials.

Let's see how relative humidity influences operations in a duplicating section.

Size and charges

In the photographic department variations in relative humidity may cause undesirable dimensional changes in films. Such changes may prove troublesome within the department, as in the case of masks; or will cause trouble at some further point of use. An example of the latter is multicolor work where the separate images must eventually fall into register. In extremely dry air, friction in the handling of film is likely to generate static electricity. This causes the film to attract dust, resulting in an abnormal amount of pinholes and an increase in opaquing time. Under certain other conditions the accumulated static can discharge (spark), causing a variety of blemishes, the more prominent being a network of fine lines in a "cobweb" or "lightning" pattern. Sparking can occur when a contact screen is removed very rapidly from the film, or when the film removed too fast from the vacuum or stayflat holder. Even yanking a dark slide out of a film holder too fast can cause discharge.

In both the stripping and platemaking departments, atmospheric variations will induce register problems with jobs that involve two

or more flats. In the plateroom, wide fluctuations in air moisture will cause any number of problems in platemaking—especially with bichromated colloid coatings. Variations will be encountered in coating thickness, drying time, exposure speed, dark reaction (self-hardening), development, image toughness, etc.

Press troubles

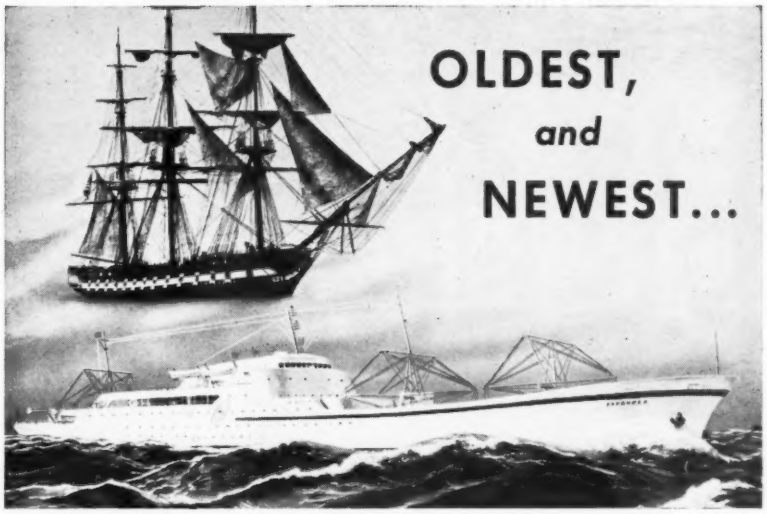
RH variations in the pressroom are even more troublesome than elsewhere. Paper fibers lie parallel to one another as a result of the paper making process. All machine made papers therefore have "grain." When paper fibers take up moisture they expand considerably in diameter but very little in length. Obviously, paper expands more across the grain than with it. Conversely, in drying, paper shrinks more across the grain. When either change takes place uniformly throughout the sheet an overall dimensional change results. Partial changes result in other distortions. When the edges of the paper change while the center remains unchanged, the result is wavy or tight edges. A difference in moisture content between one side of the sheet and the other causes curling. The latter two conditions create difficulty in running the paper through the press. The dominant problem caused by any and all dimensional changes in paper is, of course, achieving and maintaining register in multicolor work.

In extremely dry air the static electricity generated by the movement of the paper through the press results in an abnormal attraction of one sheet for the next. This not only presses the wet ink against the next sheet (offset), but adversely affects ink drying by excluding air and preventing solvent evaporation. Ink drying time is also prolonged as the relative humidity increases.

While it is possible to compensate for some conditions caused by relative humidity variations, others are not correctable at all. And when one or more effects occur at the same time, which they inevitably do, the situation is almost hopeless. Prevention is obviously more effective than any cure.

The most effective, but also the most expensive approach, is to provide artificial control (air conditioning) of the atmosphere so that the air in the essential working areas is maintained at desired and equal humidity and temperature

(*continued on page 81*)



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HYZER ON HIGH SPEED

Comparison of various light sources with respect to intrinsic brightness and duration—W. G. Hyzer

In past columns of this series we have discussed photographic lighting from time to time, with particular emphasis on incandescent- and solar-sources of illumination. This may appear short-sighted on our part in view of the numerous basic sources of light energy used in various phases of photo instrumentation work. Actually, our attempt has been to treat the more common sources first, in preparation to getting into the more unique and sophisticated systems. Before we get lost in the technical details of specific systems, however, let's take two paces back and view the broad panorama of photographic lighting from a more convenient vantage point. I have prepared a chart, which depicts the relationship between various light sources with respect to intrinsic brightness and duration.

The unit of *brightness* is the candle per unit of area. Area is measured in a plane normal to the direction from which the surface is observed. To compare the luminosity of two sources from their relative brightnesses, we must know their relative areas and distances from the observer. For example, the luminosity from an atomic bomb explosion is about 100 times that of the sun when the ball of fire is 90 ft. in diameter and 5.7 miles from the point of observation. In other words, the illumination in foot-candles received from the bomb under these conditions is 100 times that received from the sun. What are the relative brightnesses of these two sources? Illumination is proportional to brightness times area divided by the square of the distance away. Diameter of the sun is 864,000 miles. It is 93 million miles from earth, so the relative brightnesses of the bomb and the sun are:

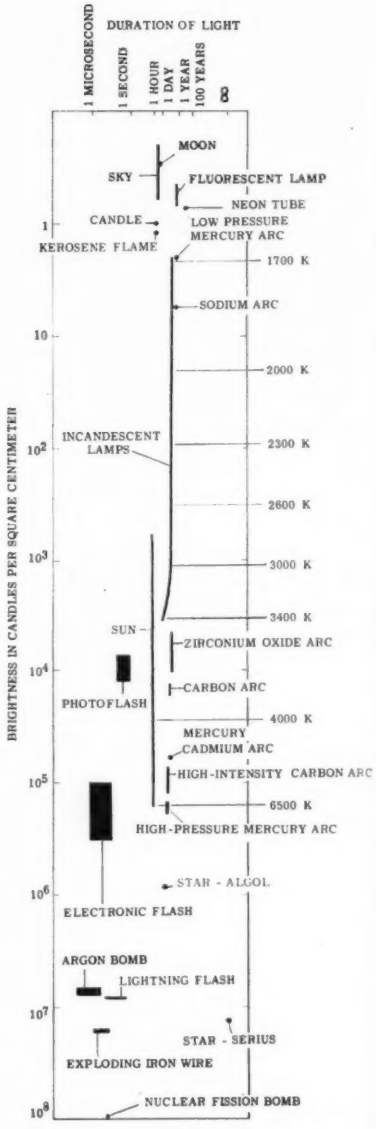
$$\frac{B_b}{B_s} = \frac{(864{,}000)^2\ (5.7)^2}{(90/5280)^2\ (93\text{ million})^2} \times 100 = 1150$$

The chart (*at right*) is far from being all-inclusive. For example, the brightness of the night sky outside of the galaxy is 5×10^{-9} candles/cm². Brightness is the only fundamental photometric quantity that the eye can compare directly. The least perceptible brightness is about 5×10^{-11} candles/cm². If we were to include these values on our chart, it would need to be more than twice as long as it already is.

Except for the stars, light producing systems have a finite life. For example, a flashbulb burns for a fraction of a second; an electronic flashtube emits light for a fraction of millisecond; a fluorescent lamp has a mean life of about 7500 hours; and an ordinary 100-watt incandescent lamp will burn out after about 1000 hours of use. Even light from the sun is limited to daylight hours. The star Algol is eclipsed every two days and twenty-one hours by its larger (but less brilliant) twin to produce light of varying intensity.

As a rule, light sources function throughout a range of brightnesses. For example, skylight varies from 0.2 on an overcast day to 0.8 can-

(*continued on page 81*)



Relationship between various light sources with respect to intrinsic brightness and duration. The scale from the top to the bottom of the chart is brightness in candles per square centimeter ranging from 0.1 to 100,000,000 (or 10^{-1} to 10^{8}). Duration of intensity ranging from less than one microsecond to infinity is scaled geometrically along the horizontal axis. We have taken the liberty of terminating this scale at infiinity, although strictly, a geometric progression never reaches an infinite value. Since infinity on our chart corresponds to some 10,000,000 years, we feel justified in this approximation. This chart is intended to show only the approximate relationships between light sources used or referred to in photo instrumentation work.

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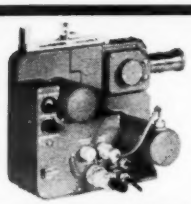
1 

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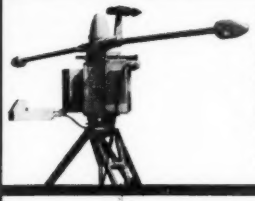
3 

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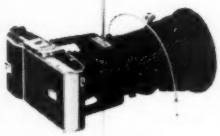
4 

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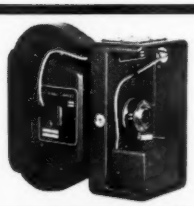
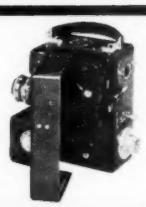
7 

Fairchild-Camerz Camera. 14 interchangeable film formats. Magazine load. Adjustable speeds. Rugged, lightweight, shock and weatherproof. Full line accessories.

8 

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Ernest E. Reshovsky

PHOTO INSTRUMENTATION

NBS cylindrical lens exaggerates turbulence in supersonic studies

An optical study of boundary-layer transition processes in a supersonic air stream has been made by W. G. Spangenberg and W. R. Rowland of the National Bureau of Standards under sponsorship of NASA. The study was made using microsecond delay multiple exposure schlieren photography.

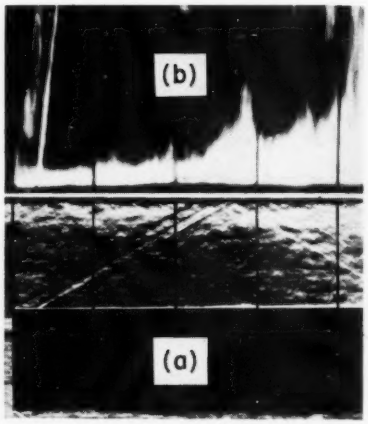
The aerodynamic boundary layer is the portion of air adjacent to an object in an air stream. Usually the fluid flow near the smooth outer surface of a missile is laminar for some distance from the leading edge and then becomes turbulent due to variations in velocity throughout the boundary layer. This change is called transition and accurate knowledge of it influences the design of re-entry vehicles.

In the past transition studies have been conducted by using hot-wire anemometers. Since these instruments are very difficult to use in supersonic and transonic air streams, schlieren photography was tried with the hope of possibly correlating these observations with hot-wire information in the future.

A schlieren system can be used to view the variations in refractive index within the boundary layer which are associated with differences in frictional heating.

1 to 20 distortion

The schlieren photographs were taken with NBS's cylindrical-lens camera, which incorporates a lens system producing unequal magnification in two mutually perpendicular directions. The image of the viewed area is recorded three times full size in the vertical dimension and 3/20 full size in the horizontal dimension. The magnification ratio of the depth of the thin boundary layer to its length permits close inspection in sequential photographs. The particular values of magnification were so chosen that the lens can be used with a standard camera body. All the elements of the lens except the condensing mirror of the schlieren system itself are contained in a tube of 2¼-in. diameter and 4 ft. long.



Boundary layer—the thin white line above black square in (a)—is made 20 times thicker by cylindrical lens in (b).

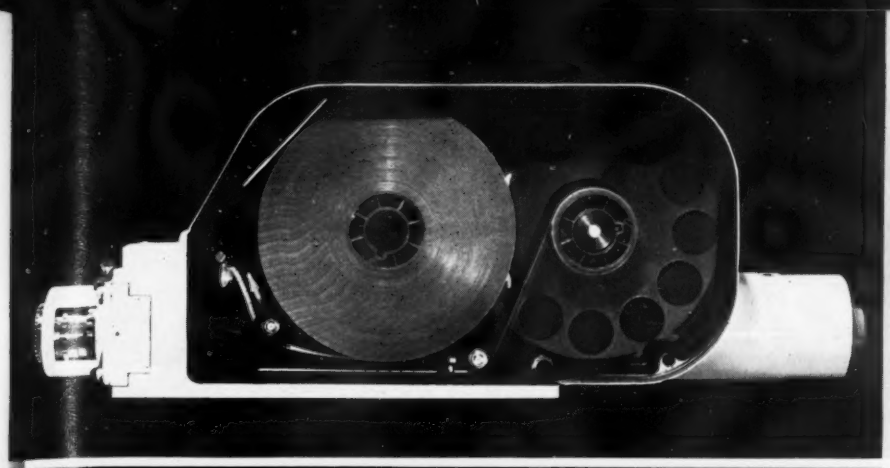
The schlieren image obtained by the use of flash or continuous light can be recorded by either a standard camera or with a 20:1 magnification ratio by the cylindrical lens camera in the NBS's wind tunnel.

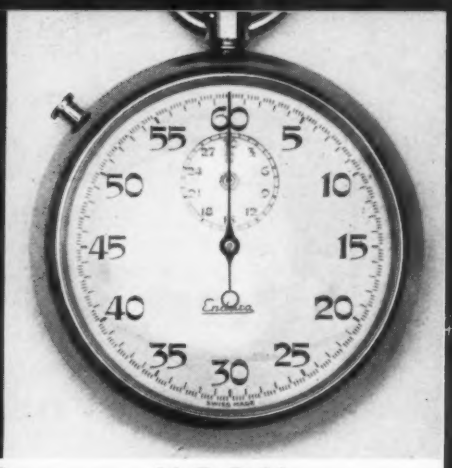
Rapid sequencing

The spark light source for the flash photographs is installed in duplicate so that two independent pictures may be taken in rapid sequence. Knowing the time-delay between two sequential photographs, velocity, growth rate, and frequency of turbulence can be computed. The continuous arc light source and the standard camera aid in visual examination of the events.

The effect of refraction of light passing through the boundary layers in the test section windows is prominent in spark photographs taken with a standard camera-lens combination and detracts from their quality. Direct photography of the boundary layer on the test body with the cylindrical-lens cam-

(*continued on page 68*)





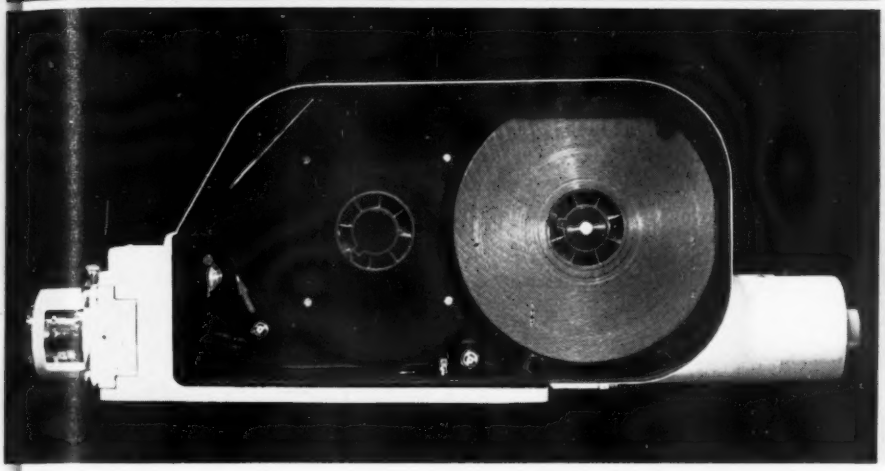


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PHOTO INSTRUMENTATION

(*continued from page 66*)

era combination produces pictures, however, that are not so adversely affected by this refraction because the depth of focus of this lens in the magnified plane is only a small fraction of the width of the wind tunnel, cancelling the disturbance.

Stressed plate shutter

A new device called a "stressed plate shutter" was recently described by Stuart M. Hauser of Electro-Optical Systems, Inc.

The stressed plate shutter is capable of providing large aperture exposures at speeds as fast as 100 microseconds with an indefinite exposure limit, and can be used in both motion picture and still cameras. Although it covers a lower time domain than electro-optical shutters are normally used in, it meets many needs where voltage is limited and aperture is critical. The stressed plate shutter operates at 3000 volts against the 35,000 volts required to operate a Kerr cell.

In addition to its low voltage advantages the stressed plate shutter eliminates the problem of leakage and handling of liquid-filled Kerr cells which makes it very applicable under rugged environmental conditions.

How it works

Construction of the stressed plate shutter utilizes an ordinary piece of glass plate mounted between a pair of rigid beams. Placed at either end of the beam are stacks of piezoelectric drivers. Voltage applied to these driver stacks cause them to expand and contract, depending upon the voltage polarity. This strain is transmitted by the rigid beam assembly to the shutter plate. Strain induced in the glass causes temporary double refraction which will change the state of polarization of a light beam passing through the shutter plate.

If the shutter plate is mounted between a pair of crossed or parallel polarizers, and a modulation voltage is applied to the driver stacks, the light beam passing through the modulator will be modulated from a full-open to a full-close.

Some of the potential applications of the stressed plate shutter could be cine shutters with speeds between 10,000 and 20,000 fps; variable density filters and as a modulator for an optical communications system in space.—THE END

BELL TELEPHONE LABS
(*continued from page 51*)

not develop the rapport with the scientists which is the basis of the group's success. Over a period of time, the scientists at Bell have come to appreciate the group's ability to make accurate scientific films. The relationship built up is a combination of personal and professional contact and is invaluable if films are to be turned out which please both the scientists and their college public.

Release of the films is handled by the local Bell Telephone companies of the Bell System. As many as 250 release prints for the whole country have been ordered for local distribution to college audiences. Cost of the prints and distribution are borne by the local telephone company.

Some of the companies obtain evaluations of the films by interviewing professors who use the films. Others ask the professors to answer simple questionnaires. The results are forwarded to the film department of American Telephone and Telegraph Co. The evaluations provide a guide for the production of future films.

The audiences viewing these films are mostly college students so potential viewers must be numbered in the thousands rather than the millions. However, it is from this group that most of the future scientists will come. Therefore, Bell feels it is reaching the audience it wishes to reach.

Films are in color or black-and-white, depending upon the subject. A lecture-demonstration film, for example, may be black-and-white because the main points are made by the speaker using a blackboard or charts. With a film like *Crystals, An Introduction,* however, color was needed to give an extra dimension: for example, so that the two different atoms found in the sodium chloride (salt) crystal could be distinguished. Dr. Dworkin chose to use magenta and light blue for the atomic model. While the production cost is virtually the same whether the film is color or black-and-white, release prints are much cheaper in black-and-white.

Since shooting is in either 16mm color or 35mm black-and-white, costs of production are about the same. In terms of time, the type of film stock used makes no difference. The same applies to filmstrips. It takes as much time to write and supervise a filmstrip as a film, though other production costs are figured to be less for filmstrips.

Two sound filmstrips were made but a poll showed that college professors preferred films and none were scheduled last year. As far as Dworkin is concerned, there is no significant difference in effectiveness between the two forms if motion is not an integral part of the presentation. However, audiences tend to prefer films to filmstrips. A minor advantage of silent filmstrips is the ability to return to previously projected frames and project them again.

To avoid costly animation, a type of filmograph animation is being planned. In this type of work, the drawings themselves do not move but the camera does, panning, zooming, tilting, etc. (See *Navy's Moving Stills,* PMI, Sept. 1960.)

Production time, from first planning to final release, usually is nine months. This time is staggered, the group working on two films at a time. *Memory Devices,* a film on basic principles of information storage devices, took six months to complete.

Although films and filmstrips are the major part of the group's work load, it also turns out an occasional TV spot. Lasting about a minute, a spot is made when it is important to present technical information accurately and quickly and is done in cooperation with the technical information group.

The group also makes educational phonograph records. In the past few years, *The Science of Sound, Sounds From Space* and *Music From Mathematics* record albums were made and distributed.

The group also produces footage for Bell System newsreels. A recent release covered visits to Bell Labs by high school students from all over the country. It is part of a program to interest high school seniors in science, a program which will soon be augmented by films planned for high school audiences.

It is quite probable, however, that even with an expanded program, the Educational Film Production Group at Bell will remain a "creative" rather than a techincal group. Dworkin feels that it is most important "for the science film maker to do the creative work so that the film can be planned to meet the highest scientific and educational standards. The technical work on the film can be done by specialists who have a specific job to do and do not have to concern themselves with either the content or the film form."—THE END

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Derald (Curly) Martin, chief of photographic services, Radioplane, a division of Northrop Corp., Van Nuys, Calif., reports: We tried the 3°/21° Heiland Spot-Meter under a variety of conditions and on several different types of jobs. It proved to be as accurate as practical field tests could determine it to be, and it was the considered opinion of the photographers who ran the tests that the Spot-Meter would be a most useful tool for (1) the man who does a lot of studio illustration in color and (2) the field man covering hazardous operations.

We found use of the unit to be simple and convenient, although one man did have trouble with using two positions on the one switch button, and that arrangement could lead to error. It is also unfortunate that the light value numbers on the meter's scale seem to be arbitrary values that don't match up with any other systems. The tendency of photographic equipment manufacturers in recent years to standardize where ever possible has been a great help to photographers, and we wouldn't want to see them going back to dozens of proprietary systems again.

In studio use, the meter was extremely useful in evaluating lighting contrasts from camera position, and the unit would probably pay for itself in saved film and man-hours in any studio doing a lot of color work.

From our point of view in the missile industry, the most important use of the meter would be in taking readings from a distance in telephoto situations. Any photographer who has covered missile launchings, engine tests, or destruct tests knows that it is often impractical to walk up to the subject and take a reading—the hazard is just too high, dedicated photographer or no dedicated photographer. Coupled with this high hazard level is the high unreliability factor in test scheduling—a test scheduled for 0730 may "go" at 0730, 0945, or 1425. The sun rises and sets, clouds come over, and the light changes. The cameras that are wired into the launch circuit and bolted to the test stand may have to depend on the latitude of the film, but the photographer who is following the action from a bunker, blockhouse, or a greasewood bush will hope to change his camera settings with the light changes. The Spot-Meter would then be most useful.—THE END

A-V IN USE

(*continued from page 47*)

rules. The film, at first over 10,000 ft. long, was edited to 3,000 ft. of 16mm film. Covering the one-man operation of trains in the Chicago Transit Authority to prove it could be done, the film was shot at 16 fps. This speed was needed because existing light levels in the subways were rather low for the color film used in the movie. Even though High-Speed Ektachrome was used, prints had to be pushed. However, the final results were satisfactory, giving an excellent camera-eye view of Chicago's subways in color.

About ten minutes of the film is narration by a railway official. This sound was recorded using a Nomad recording system giving lip-synch. In final form, a magnetic stripe was added to the film and the narration transferred from the Nomad system.

The picture was made by the Illinois Central's audio-visual service under the management of John T. Hawkinson.—THE END

Hearing at which film was used to argue for lower manning requirements

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AUDIO-VISUAL

LENTICULAR SCREENS 201
Radiant Mfg. Corp. 12-page booklet, *The Miracle of Lenticular Screens,* tells with the aid of graphs, illustrations and charts, all about lenticular projection screens.

A-V EQUIPMENT RENTAL 202
McCarthy Distributors, Inc. Price schedule lists rates for daily or weekly rental of A-V equipment from this New York firm.

MICROPHONES 203
Electronic Applications, Inc. 16-page brochure describes the AKG microphones of the dynamic and condenser type. Includes specifications.

KINOPTIK ACCESSORIES 204
Karl Heitz, Inc. Three-hole punched catalog sheet lists Kinoptik accessories. Includes prices and specifications.

QUESTION AND ANSWER 259
Technical Service, Inc. 4-page illustrated folder on how to select your 16mm projectors. Describes the Teclite, Duolite, and Moviematic projectors.

MAG-MATIC MESSAGE REPEATER 260
Couisino Electronics Corp. Description sheet on Mag-Matic Message Repeater Model MR-2321. Gives step by step process for use.

ARC SLIDE PROJECTOR 261
Strong Electric Corp. 4-page illustrated folder describes the Universal arc slide projector.

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ZOOMAR-REFLECTAR 205
Zoomar, Inc. Illustrated catalog sheet describes the 40, 80, 100 and 150-in. Zoomar-Reflectar lenses. Includes specifications.

HULCHER 70 206
Charles A. Hulcher Co., Inc. 4-page illustrated folder describes the Hulcher 70, Model 102 70mm sequence camera. Includes specifications and list of available modifications.

FILTER REQUIREMENTS 207
Ednalite Optical Co. Illustrated booklet, *When . . . Why . . . How,* lists all pertinent facts about filters needed with new Kodachrome II Daylight and Type A films.

35MM RECORDING CAMERA 208
OPTOmechanisms, Inc. Catalog sheet describes and illustrates the Model 2058 recording pulse camera. Includes technical data.

TRAID WINDS 212
Traid Corp. 16-page magazine, *Traid Winds,* features in its April issue an article on the Air Force Experimental Rocket Engine Test Station in the Mojave Desert. Includes a four-page section on optics especially designed for photo instrumentation work.

ROBOT CAMERAS 214
Karl Heitz, Inc. 22-page catalog *Photographic Automation in Science and Industry.* Describes different types of Robot cameras for photographic automation.

MINOLTA SR-3 215
Minolta Cameras. Illustrated folder gives complete specifications for the Minolta SR-35mm single lens reflex and accessories.

'SCOPE RECORDING CAMERA 216
Electronic Tube Corp. Catalog sheet describes and illustrates the Model SM-100 ETC 'Scope Recording Camera. Includes specifications.

OSCILLOSCOPE CAMERAS 217
Southern Instruments Inc. 4-page illustrated brochure describes Types M906 and M1020 Southern oscilloscope cameras. Includes technical data.

ELGEET MICROSCOPES 219
Elgeet Optical Co., Inc. Three-hole punched catalog sheet describes and illustrates the Olympus Models SS-2 and SS-3 microscopes. Includes specifications and prices.

EXPOSURE CONTROL 258
Zoomar, Inc. Illustrated catalog sheet describes the Zoomar-Trulex "through the lens" automatic exposure control *for tracking and instrumentation only.* Includes price and specifications.

EQUIPMENT

ECONO-LAB 209
Walter Voss, Inc. 4-page illustrated brochure describes and illustrates the Kindermann Econo-Lab Type MK-1 for color positive processing.

COLOR ANALYZER 218
Midwest Aerial Photographic Survey, Inc. 6-page illustrated brochure describes the Speedmaster color analyzer for commercial photographers, photo finishing and commercial color labs. Includes specifications.

SCIENTIFIC EQUIPMENT 221
Lafayette Instrument Co. 12-page catalog describes and illustrates scientific equipment available including learning apparatus, motor skill apparatus, sensory and perceptual equipment, etc.

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It's not top secret... that the QuantaLog® Model EP-1000 analyzes color negatives better, faster than any instrument available. With this precise sensitive instrument, you establish your color balance and exposure standard, dial it in...and you're set for accurately analyzing production negative after negative. The EP-1000 will give you prints with controlled color balance and exposure the first time, *every* time.

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FOOT CONTROL VALVES 220
T & S Brass & Bronze Works, Inc. 4-page catalog illustrates foot control valves and service fittings on automatic water service systems.

TECHNICAL SUPPLIES BULLETIN 222
Consolidated Electrodynamics. Three-hole punched bulletin illustrates and describes Datarite recording papers Types 22 and 33 and developer solutions Types 49943-3 and 49943-4.

AIR COMPRESSORS 223
Bell & Gossett Co. Illustrated catalog sheet describes the Bell & Gossett oil-less tank mounted air compressors for film processing equipment.

COLD CATHODE LAMP 224
Aristo Grid Lamp Products, Inc. Technical data sheet describes the Aristo cold cathode lamp for industrial, graphic arts, medical and electronic photography.

KREONITE SINKS 225
Kreonite, Inc. 4-page folder describes and illustrates the Kreonite line of sinks and accessories. Complete specifications.

MACBETH QUANTALOG 226
Macbeth Instrument Corp. 4-page illustrated folder describes the Model EP-1000 Quantalog photographic color analyzer. Also lists accessories and applications.

OMEGA ENLARGERS 227
Simmon Brothers, Inc. 24-page booklet gives complete list of Simmon Omega enlargers and accessories. Includes prices.

CORRECT EXPOSURE 228
Kling Photo Corp. 4-page brochure, *Correct Exposure made Easy,* describes the uses of the Gossen Pilot meter and contains illustrations showing the procedure for correct exposures using the Gossen Pilot.

APAC PRINTERS
American Photographic Appliance Corp. 20-page catalog describes and illustrates the APAC line of printers and accessories. Request on letterhead from APAC, Greenfield, Massachusetts.

GRAPHIC ARTS

PHOTOCOPY MACHINE 229
Photorapid Corp. Catalog sheet describes and illustrates the Meteor photocopy machine. Includes list of specifications.

LINEMASTER 230
Litholine Mfg. Co. 4-page illustrated folder describes the Linemaster instrument for layout, stripping and ruling. Includes specifications and prices.

DUPLO FILMS 231
The Gevaert Co. of America, Inc. 4-page folder briefly describes the characteristics and the various sizes available in Gevaert Duplo Films. Includes section on processing these films.

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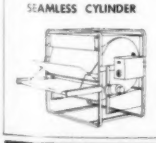

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Get more information. Circle 444, page 75

HOT PRESS TITLING 262
Hot Press Co. Color chart and type specimens in 24 colors for film titles, slides, charts, flip cards, etc.

PIERCE PERF-A-MATIC 235
Pierce Specialized Equipment Co. 4-page folder describes and illustrates the Perf-A-Matic automatic feed rotary perforator, scorer and slitter. Includes specifications.

GRAPHIC ARTS PRODUCTS 236
Direct Image Corp. 4-page illustrated folder describes graphic products available including masking sheets, clean up sheets, photo blotters, blankets, etc.

BLANKET SAVER 237
Hurst Plastics. 4-page leaflet describes the Hurst blanket saver for offset presses.

PAPER CUTTER 238
Michael Lith Sales Corp. Illustrated catalog sheet describes the Triumph Jr. paper cutter. Includes specifications and prices.

ANSCO PLESTAR 239
Ansco. 6-page folder gives complete data on Plestar, a dimensionally stable film base. Includes information on Reprolith Ortho Type B film now coated on Plestar.

COLOR SEPARATOR 241
Durst (USA), Inc. Folder contains specification and price sheets on the Durst G-139 color separator.

PHOTOS IN ALUMINUM 242
Grover Photo Products. 16-page booklet describes the Metalphoto experimental kit No. 17 for making photographs in aluminum. Outlines process.

STAT-LITE 243
Natural Lighting Corp. Illustrated specification sheet describes the ColorTran Stat-Lite for photocopying operations. Includes prices.

PHOTO COMPOSITION 244
Electro-Rex Corp. of America. 4-page booklet describes and illustrates the Foto-Rex portable machine for setting display type. Includes prices.

MOTION PICTURES

RENTAL MOVIE EQUIPMENT 245
Camera Service Center. 12-page booklet lists motion picture equipment available for rental and prices.

ANIMATION EQUIPMENT 246
Richardson-Bowlds. 20-page catalog describes and illustrates animation equipment available including camera stands, cameras, planning and checking boards.

ANIMATION STAND 249
Florman & Babb, Inc. 4-page specification sheet gives detailed information on the Triplex animation stand. Includes prices of stand and accessories.

RENTAL PRICE LIST 250
Camera Equipment Co., Inc. 16-page booklet lists motion picture equipment available for rental. Includes daily and weekly rates.

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MOTION PICTURE ACCESSORES 247
Hudson Photographic Industries, Inc. 12-page catalog describes and illustrates movie viewers and editors and Quik Splice splicers and tapes.

8MM MAGNETIC SOUND 248
Geo. W. Colburn Laboratory, Inc. Booklet contains information on the history of 8mm magnetic sound, procedures and techniques for producing sound films, illustrated review of processing and the advantages of 8mm magnetic sound films.

SERVICES

COLOR SERVICE 251
Jack Ward Color Service, Inc. 12-page booklet outlines color services available from this New York lab and includes prices.

BERKEYCOLOR 252
Berkeycolor, Inc. Illustrated booklet, *Focus on Color,* gives details on color processing from this New York lab. Includes prices.

COLOR PRINT SERVICE
Colortronics. 4-page brochure describes the Colortronic method for making Ektacolor prints using LogEtronic equipment. Photographic samples are included. Request on letterhead from: Colortronics, 911 G. St., N.W. Washington 1, D.C.

SUPPLIES

SILVERCEL BATTERIES 253
Yardney Electric Corp. 10-page brochure provides electrical and physical characteristics of the silver-zinc battery system. Is illustrated with performance curves comparing these batteries with ordinary battery systems.

FILM CLEANING 254
Nicholson Products Co. Leaflet, *A Suggested Method for Cleaning Film Faster and More Effectively,* includes drawing showing best placement of the rewinds, cleaning pad, idler rollers, and the proper motor and speed control to use with a power driven cleaning assembly.

EDWAL MINICOL 255
Edwal Scientific Products Corp. Three-hole punched bulletin describes Edwal Minicol developer. Includes instructions for use, keeping characteristics and precautions.

MARSHALL'S SPRAYS 256
John G. Marshall Mfg. Co., Inc. 6-page folder describes the four Marshall sprays, Pro-Tek-To, Spray Glass, Pre-Color and Photo-Mount. Includes prices.

UNIBATH PROCESSING DATA 257
Cormac Chemical Corp. Series of Unibath Processing Data charts provides complete sensitometric information on the processing of black-and-white films. A summary paragraph provides recommendations not included in data or charts.

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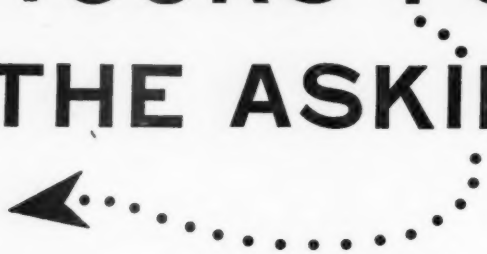

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NEW PRODUCTS

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OSCILLOGRAPH KIT **101**
A liquid-concentrate oscillograph kit suitable for use in CEC Oscillograph Processors, has been announced by the National Research & Chemical Co. Called Oscillograph Kit No. 40, it contains four concentrated solutions—developer, stop bath, stabilizer #1 and stabilizer #2. A one gallon kit provides two complete fillings, enough to process about 1000 to 1200 ft. of oscillograph paper. Prices: gallon kit, $12; five gallons, $48.

CINEMASTER CONVERTER **112**
ColorTran has made available its 40 ampere Mark II Cinemaster Converter, designed to control eight 500W PAR 64 Lamps at 3400 degrees K. Its lamp capacity with 200/240 Volts Input is 4075 Nominal Watts at 3400 degrees K; and with 100/120 Volts Input, 2200 Nominal Watts at 3400 degrees K. The Converter measures 9 x 9¾ x 12 in. and weighs 50 lbs. Price: $258.

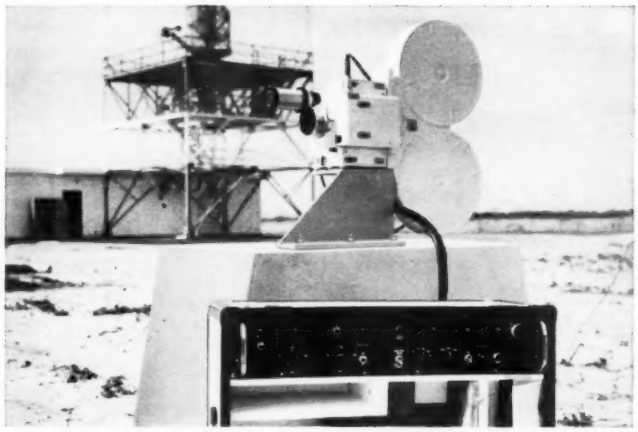
KONICA "FS" **103**
The Konica Camera Company has announced its Konica "FS" single lens reflex that permits synchronization with regular "M" bulbs up to 1/1000 sec. With speedlight, it is claimed that the camera can be accurately synchronized at all speeds up to 1/125 sec. This synchronization is made possible by a Hi-Synchro focal plane shutter with blades that travel the shorter, vertical distance of the camera and expose the entire negative area in 7.5 milliseconds. The all-metal shutter is said to be unaffected by temperature or humidity, and offers a full range of shutter speeds from 1 sec. to 1/1000 sec., plus B. The Konica "FS" is equipped with a 6-element Hexanon 50mm f/2 lens but offers extensive lens interchangeability. Price: $189.95.

VARI-FOCUS ZOOM LENSES **104**
Two new lenses have been announced by the Wollensak Optical Co.—the Wollensak 20-60mm f/1.8 Vari-Focus Zoom lens in focusing mount for standard 16mm cameras, and the WF-220 28-75mm f/2.3 for the Fastax. Both offer photographic resolution better than 50 lines per millimeter on Plus-X film and a focus scale of 5 ft. to infinity, according to the manufacturer. Prices: "C" Mount, $298; WF-220, Fastax, $345.

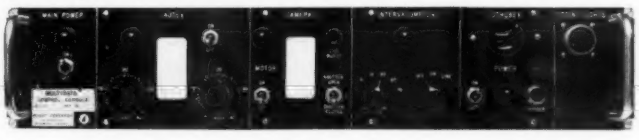
ARC LAMPS **105**
An arc lamp said to fit all photo composing machines is nuArc's model N-110. It incorporates a motor-driven mechanism that automatically controls the feed of the carbons and keeps them correctly spaced, it is claimed. It has no moving parts, which eliminates the need for adjustment, and features heavy duty glass insulated transformers and a blower mounted to the power unit to prevent overheating.

EDITING TABLE **121**
A high-speed editing table and viewer for rapid sound film scanning has been introduced by the Camera Equipment Co. Inc. Called the CECO High-Speed Editing Table, it is available in 16mm and 35mm models, featuring operation from 0 to 250 fpm in both forward and reverse. It has a 4 x 6 in. brightly illuminated screen and comes equipped with a footage counter and optical sound head. Prices: 16mm, $2500; 35mm, $1750.

ON-SITE PHOTODATA



Camera is removed from case and set up. Backlighted control panel is connected to camera and to 110-volt power by two integral cables. The complete system is then ready to operate. Extra film, lenses and accessories are stored conveniently in case. Connections for Strobex Model 122 electronic flash are included.



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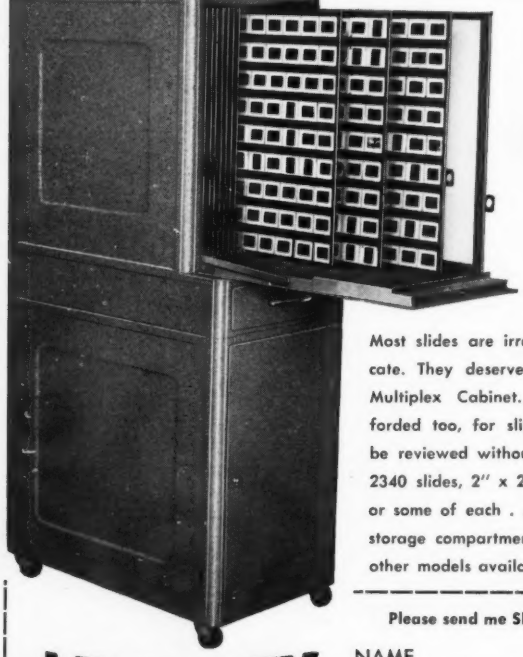

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SELECTIVE SLIDE PROJECTOR 102
An automatic, selective slide projector that permits a particular slide to be shown at the push of a button is the Spindler & Sauppe, Inc., Selective Selectroslide Model SLS-750. It features an interchangeable rotating magazine that holds 48 slides in a radial arrangement. A remote push-button control unit selects the desired slide, has it moved into position and projected. The projector accommodates 2 x 2 in. 35mm slides for all lenses from 1½ to 11 in., and Bantam or Super-slides with lenses of 4-in. focal length or longer.

DYNAMAX POWER PACK 108
Gordon Enterprises Dynamax Power Pack is a long-life D.C. power source for the operation of motion picture and sequence cameras, tape recorders and other data recording instrumentation. It is a nickel-cadmium battery with six to ten ampere-hour capacity which, it is claimed, can be recharged repeatedly with no known limit of service. It is available with 12 and 24 volt outputs for use with the Hulcher, and other cameras with similar power requirements. A dual Power Pack for Arriflex users supplies either 8.5 or 17 volts, permitting use of one unit for both 16mm and 35mm models.

K-2 KODACHROME PROCESSOR 111
The Houston Fearless Model 515 K2 automatically processes both 8/16mm and 35mm Kodachrome K2 film either simultaneously or separately; or can develop two reels of 8/16 at once. Independent drive systems for the two film sizes are on opposite sides, but utilize the same tanks for solution, rinse and wash, plus a common dry box. Speeds are 12½ fpm for 8/16mm and 5 fpm for 35mm. The processor measures 5 ft. high by 16 ft. long.

TINY MAC SPOT 113
Measuring 5 x 5 x 7 in., J. G. McAlister's "Tiny Mac" spotlight can be mounted on a camera or on most light stands. It has a simple focusing adjustment from concentrated spot to full floodlight beam and is color corrected for all 3300K color films for indoor shooting. Price: $29.50.

RECORD STABILIZATION KIT 114
POP 300, a liquid concentrate kit for the stabilization of Eastman Linagraph Direct Print paper in a Type 23-109 Oscillogram Processor has been announced by the Technical Supplies Department of Consolidated Electrodynamics Corp. The kit includes a special bleach which compensates for the fogging effect of secondary exposure, a special developer, and conventional stabilizers. It is packaged in plastic containers as a liquid concentrate

PHOTO RAPID COPIER 124
Simplicity of operation and ease of cleaning are claimed as two major features of Photo Rapid's Meteor Copier. Using Gevaert, Ampto, and Agfa, as well as other papers, the unit can copy from full size books. Because of good contact, it is said to produce a high-quality reproduction. Price: $169.

THERMOCOPY PAPERS 115
Photek, Inc., has made available a line of Thermocopy Papers in both opaque and translucent sheets, in 8½ x 11 and 8½ x 14 in. sizes. Other standard sheet sizes will also be produced. The opaque sheet is designed for general office copying in thermographic machines, while the translucent material can be copied on either side and will also serve as a diazo master.

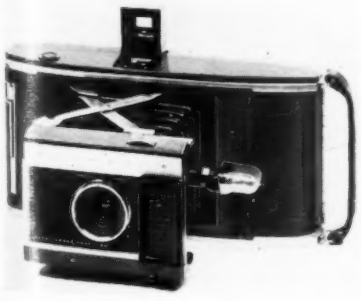
MICROFILM READER 118
A pocket microfilm reader with 10X magnification has been developed by the Taylor-Merchant Corp. It is made of laminated card stock with a built-in focus device that allows the entire unit to fold flat and slip into its own plastic wallet. Its design permits vertical and horizontal scanning while holding the subject microfilm steady. Price: $2.50.

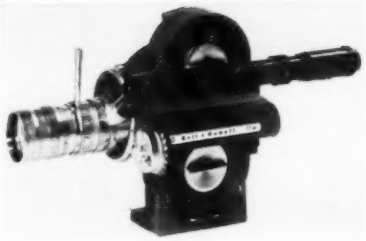
RICOH AUTO-ZOOM 106
Allied Impex has introduced a semi-automatic 8mm camera with electric motor drive called the Ricoh Auto-Zoom. It has a motor-operated f/1.8 zoom lens with focal lengths from 10 to 30mm, and through-the-lens focusing and viewing with a beamsplitter in front of the diaphragm. ASA 10 to 40; 16 fps; battery level indicator. Price: $139.95.

POLAROID J66 107
The latest offering from Polaroid, the J66 uses a 4½ in. Meniscus lens and electric-eye controlled shutter with speed from 1/15 to 1/1000 sec. The lens is ground with steep curves, said to provide a flat field at the focal plane. "Normal" setting aperture is f/32 with a "lighten-darken" control giving openings of f/19 and f/64.

Camera has X-synch for AG-1 bulbs for either direct or bounce flash. Reflector is designed for diffused, uniform light distribution. Basic operation involves no focusing or exposure setting. Special close-up focus extension can be used for pictures to 30 in. from lens.

Finder has projected frame lines. Selenium-type photoelectric cell covers brightness range from 6.25 to 600 foot candles per sq. ft. when Polaroid 3000 film is used. Price: $89.50.





TRAID TWENTY-EIGHT 109
An addition to the Traid Corporation's Twenty-Eight Variable Focal lens is a built-in, through-the-lens viewfinder that can be positioned for any spot in the 360 degree range around the camera. The lens fits any "C" Mount 16mm camera and provides focal lengths from 20mm to 80mm, for wide angle, normal or telephoto shots.

REPEAT-CYCLE TIMER 110
The Technitron Repeat-Cycle Timer features independent time rate controls for the on and off cycle, lights to indicate the relay position and a hold switch to lock the relay in either position. Maximum and minimum time rates for both the on and off cycle are approximately 30Ms to 3 min. on the standard model with a 15 amp control relay. Typical uses are in gas burst control, camera pulsing and time lapse photography.

MICRO-MASTER 122
The Micro-Master Camera-Projector, which combines two miniaturization systems—105mm and 35mm—in a single unit, is a new product of Keuffel & Esser Co. With camera and projector in a single overhead assembly with interchangeable magazine, it is claimed that shifts can be made in seconds from camera to projector, 105mm to 35mm, roll to sheet film and black-and-white to color.

ARCA-SWISS VIEW CAMERAS 116
A line of view cameras carrying the Arca-Swiss brand name has been announced by the Standard Camera Corp. It consists of 5 models ranging in size from 2¼ x 3¼ to 8 x 10, each featuring spring-loaded locking notches for standard positions and two sets of angle scales which facilitate the parallel positioning of the lens and the image plane. Each camera may be used as an enlarger, as a copy camera with the accessory vertical repro-stand, and as a press camera, among other applications. Prices: $225 to $643.

TRANSPARENCY ILLUMINATOR 125
Bartlett Research, Inc. has announced the introduction of the Bartlett Transparency Illuminator Model 120, which can accommodate any transparency or combination of transparencies from 35mm slides to 8 by 10. This is made possible by a series of 11 movable channels which attach to the face of the unit. Viewing area of the "BTI 120" is 24 x 24 in. and the unit is 7½ in. deep. It will hold 120 35mm 2 x 2 slides or any combination of transparencies, illuminated by one standard 20-watt fluorescent lamp, with a Kelvin rating of 4350.

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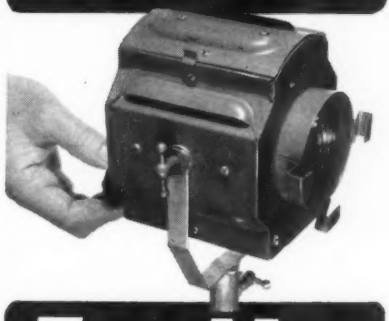

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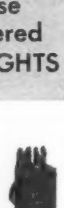

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ANSCO MEMO MASTER 117
A 13-25mm focal length Zoom lens, which permits a 200 per cent increase in picture size without moving the unit, is a feature of Ansco's 8mm Memo Master motion picture projector. Weighing under 10 lbs., it also offers slow-motion projection speed as well as reverse action. Price: less than $90.

ENLARGING LENSES 120
Kling Photo Corp. has announced the availability of high resolution Ysaron enlarging lenses made by the Rodenstock Optical Co. These color corrected lenses are available in 6 focal lengths from 35mm to 5 x 7 in.

PLAYBACK SYNCHRONIZER 123
A transistorized playback synchronizer for synchronizing ¼-in. tape with sprocket-driven film is available from the Magna-Tech Electronic Co., Inc. Called Type 92B, the unit can correct speed deviations of +20 per cent to –20 per cent from sync speed, according to the manufacturer. It can be used with most tape transports, it is claimed, including the Ampex 350, 351, 354, 300, 400 and others. The unit features a 14KC rejection filter built-in, automatic speed control for sync transfer of tape to film, manual speed control for varying pitch, special effects, trimming time spots and projector synchronization. Price: $1920.

AERIAL MAPPING FILMS
Three aerial photographic films for topographic mapping have been announced by the Eastman Kodak Company. They are made with an Estar polyester base and have a gelatin backing to reduce curl and protect against static. Films coated on the new .004-in. Estar base are Kodak Panatomic-X Aerographic Film, Kodak Plus-X Aerographic Film and Kodak Tri-X Aerographic Film.

MAGNERASER 152
A demagnitizer that erases recorded signal on all brands of sound tape as well as on ¼-in., ½-in., and 16 and 35mm magnetic sound film directly on the reel without need for rewinding has been produced by the Amplifier Corp. of America. Called the Magneraser, it can handle tape and film on plastic or metal reels of any size from 5 to 15 in. and can also be used to demagnetize record-playback and erase heads. Weighing 2½ lbs., it comes in two models: 200-C for 100-130V and 220-C for 200-260V.

HYZER ON HIGH SPEED

(*continued from page 64*)

dles/cm² on a clear day. The sun is brightest at the merdian and falls to less than 1000 candles/cm² at sunrise and sunset. Tungsten lamps may be varied throughout a wide brightness range depending upon the voltage applied.

You are undoubtedly familiar with most of the light sources included on the chart, except perhaps the argon bomb and the exploding bridge wire appearing at the lower right-hand corner of the diagram. These sources are common to ultra-high-speed photographic work, primarily in the study of explosive phenomena. Both of these systems may be used either as an intense, short-duration flash for single-frame photography or as a "continuous" source for multiple framing cameras operating in the million frames per second range. The Beckman & Whitley Model 189 framing camera for instance, exposes 25 frames in a total time of about 6 microseconds. With careful synchronization, a light source having a duration of about 10 microseconds would be adequate for this purpose. The explosive argon flashlamp (or argon bomb) is based on the principle of generating an explosive shock wave in a layer of argon gas to produce light by excitation. This is essentially the same principle used in a neon sign, except high voltage is used to excite the inert gas and the resulting light is many orders of magnitude less intense. Duration of flash from an argon bomb is determined by the time required for the wave to pass through the inert gas and into the surrounding atmosphere. Flashes as short as 10^{-8} seconds have been produced by modifications of this system using extremely thin layers of argon. Uniform flash durations of 35 microseconds can be obtained using larger volumes of gas.

Fine bridge wires, fired by discharging a high-voltage capacitor through them, produce light of extremely high brilliancy. Brightnesses ranging up to 16 x 10^6 candles/cm² are produced by discharging a 1 μ fd condenser charged to 20,000 volts through a fine iron wire. Usually, light from the bridge wire is used to silhouette the event, by placing the source and a field lens behind the subject on the optic axis of the camera. The exploding wire is imaged within the camera's optical system by the field lens. More about these and other unique lighting systems in future columns.

GRAPHIC ARTS

(*continued from page 63*)

levels. This not only eliminates the problems caused by atmospheric variations, but likewise creates an environment under which both materials and personnel can operate at maximum efficiency.

The next best thing is the installation of equipment to regulate the moisture content of the air. If adding moisture to the air is the problem, humidifying devices are often quite practical when seasonal conditions and central heating tend to lower relative humidity indoors. While there are many devices available for removing moisture from the air, if dehumidification is the problem, complete air conditioning is likely to be the best solution.

Another approach is to provide an efficient air circulation system designed to average out the air in the different working areas. While this neither controls nor regulates humidity, at least it helps avoid the problems caused by variations from one room to the next.

The influence of variations in relative humidity in the printing industry has been studied in detail. The results show that humidity control will reduce spoilage, reduce working and waiting time, increase production and generally provide the conditions under which optimum quality is obtainable. For readers who wish to investigate the problem in greater detail, the following literature is suggested:

What The Lithographer Should Know About Paper Lithographic Technical Foundation, Inc. Publ. No. 308 ■ **What The Lithographer Should Know About Ink** Lithographic Technical Foundation, Inc. Publ. No. 310 ■ **The Sensitivity of Bichromated Coatings** Lithographic Technical Foundation, Inc., Publ. No. 218 ■ **Humidity Control In The Printing Industry** The Bahnson Co., Winston-Salem, N.C. (Gratis)

KODAK PAMPHLETS (Gratis) Q-32 Physical Characteristics of Kodak Polystyrene Base Films ■ **Q-33** Dimensional Stability of Kodak Acetate Films ■ **Q-34** Physical Properties of Kodak Estar Base Films

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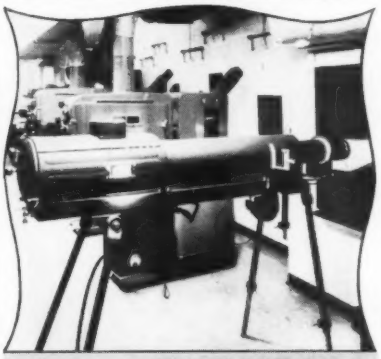

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Exceptional color accuracy, greater sharpness, and complete processing compatibility make this exciting 35mm duplicating film a new standard in duplicating materials. Here is a 35mm duplicating film that can be processed in your regular Anscochrome chemicals. This new, compatible duplicating film gives you the benefits of: **Controllable Contrast.** A superior curve conformity permits adjustment of contrast values through processing manipulation. Color fidelity and saturation are uncompromised. **Higher D-Max!** Richer blacks and open, untinted highlights combine with improved sharpness for cleaner, more accurate reproductions. **Ease of Use.** Anscochrome duplicating film has both processing reproducibility and latitude. It works equally well in small tanks or in large, automatic processing equipment. The printing speed is higher for improved production rates. Anscochrome Type 547 dupes will stand side-by-side comparison with the original. If you make color dupes, it will pay to try this new, easier-to-use material. Available in 35mm (Type 547), 70mm (Type 747) and sheet sizes (Type 647). Ansco, Binghamton, New York, A Division of General Aniline & Film Corporation.

Ansco
Type 547

Get more information. Circle 403, page 75

Here are your insurance policies for Kodak roll film

In these pigeonholes are some of the final test strips for Kodak roll films which have passed all the Kodak picture-making tests. No tougher tests exist for film.

These strips are *your* insurance—one for every type of Kodak roll film.

Insurance that you'll bring back all the story any film could see—when you load Kodak Tri-X Pan, Improved Type. (*Improved* means bigger and better enlargements, new crisp quality for available-light pictures.)

Insurance that you won't need a second chance if your camera is loaded with Kodak Plus-X Pan Professional—the film photojournalists call "general-purpose."

Insurance that your pictures won't have grain enough to show—even in huge enlargements—when you use Kodak Panatomic-X Film.

At Kodak there is no such thing as film that's "uniform enough." Uniformity is an obsession in our manufacturing group. Their tests are your insurance that your film will work the way you expect it to.

Your Kodak dealer keeps them all fresh and instantly ready for you.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.